Four Years' Work

in

Number

by

Mary A. Bacon
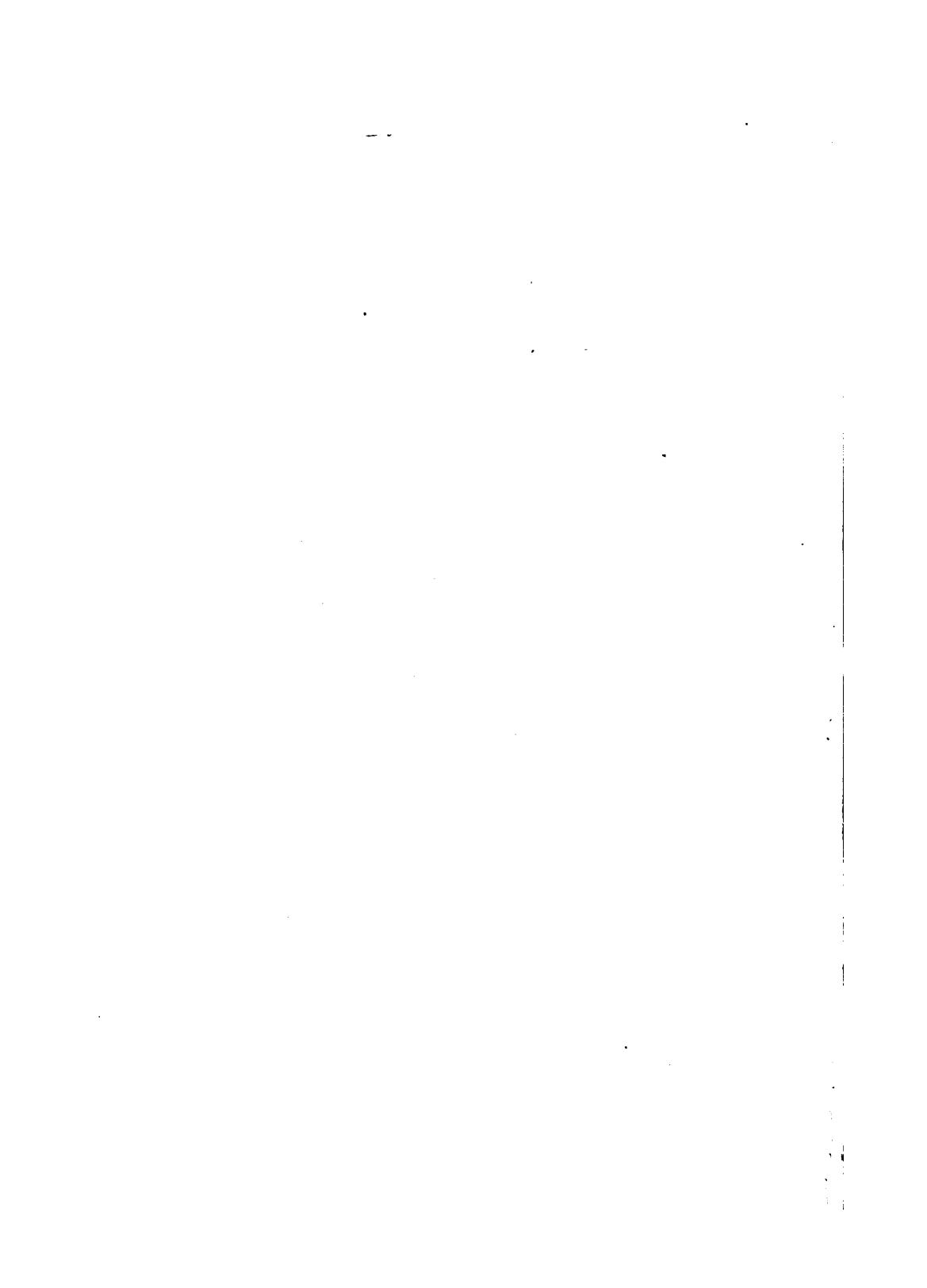
Four Years' Work in Number.

An Inductive Arithmetic

FOR

CHILDREN.

By

MARY A. BACON,

Of the Georgia Normal and Industrial College,

Milledgeville, Ga.

THIS BOOK IS DEDICATED
TO MY FELLOW-WORKERS IN
THE HAPPY PROFESSION OF TEACH-
ING OUR LITTLE BROTHERS AND SISTERS, IN
THE HOPE THAT IT MAY MAKE THE
"ARITHMETIC LESSON" A LITTLE
EASIER FOR ALL OF US.

CONTENTS.

PART I.

PART II.

SUGGESTIONS TO THE TEACHER.

1. **NUMBERS LEARNED OBJECTIVELY.**—In this book, the numbers from 1 through 100 are treated successively. Until the first 20 numbers, at least, are learned, prepare for each printed lesson by giving an oral lesson on the subject treated, letting the child find out for himself the facts in the number. For example; before assigning Lesson VII., give each pupil 8 blocks, beads, sticks, or other objects, and have him discover without your aid that in 8 there are 2 fours, 4 twos, 2 threes and 2 or 2 and $\frac{2}{3}$ threes, 7 and 1, 6 and 2; that 8 separated into fours is 2; 8 less 5 is 3, etc. So with all numbers; let the knowledge of them have an objective basis; as indeed it must have if there be any knowledge. Some teachers prefer a uniform system of comparisons. The following is good, and may of course be used in the comparison of any two whole numbers, or any two fractions, or with a whole number and a fraction:

6 compared with 3.	6 compared with 5.
$3+3=6$	$5+1=6$
$2\times3=6$	$1\times5+\frac{1}{5}$ of $5=6$
$6-3,-3,=0$	$6-5=1$
$6\div3=2$	$6\div5=1$ $(\frac{1}{5})$
$3=\frac{1}{2}$ of 6	$5=\frac{5}{6}$ of 6

2. **THE SIGNS.**—$3+4=7$. The child sees with his eyes or mentally, 3 objects in one group, 4 in another; the two groups united make one group of 7.———$7-3=4$. "*Is*" 4, or "*are*" 4? If he thinks of the objects separately, as he probably will for a time, he will say, and correctly, "*are*." If he thinks of the number 7 itself,—in reality as much of a unit, when so thought of, as 1—he will say, and correctly, "Seven less three *is* four."———$4\times3=12$. The sign $\times$ means that the numbers between which it stands are to be multiplied, without indicating which is multiplier, or which multiplicand. In Part I. of this book the first number is invariably considered as the multiplier. 4 threes are 12, or 4 times 3 is 12. With children a uniform method of reading should be adopted. In the longer operations that come with reduction, interest, etc., this arbitrary distinction need not be kept up, since the pupil can then see for himself which of the two numbers is really concrete.———$12\div6=2$. This may be correctly read, "12 separated into 6's is 2;" or, "In 12 there are 2 sixes;" or, 12 divided by 6 is 2." If the last reading is adopted, care must be taken that the pupil understands the real meaning, which is that of the first two readings. It does *not* mean

the same as $\frac{1}{6}$ of $12=2$. The difference between Division ($\$12 \div \$6 =\ 2$) and Partition ($\frac{1}{6}$ of $\$12 = \$2$) is carefully observed in this book. The child taught objectively will never get the two operations confused. Later on, in reducing compound quantities, working problems in interest, etc., the *form* of Division is sometimes used when the operation is one of Partition. At that stage of his progress, the pupil will understand the difference, and that this form is used only for convenience.

3. COMPOUND QUANTITIES.—Lessons XII. and XXIV.—Have on your desk a box of sand or sawdust with the wooden pint and quart measures, a pail of water with the tin measures. Let the children dis over for themselves the number of pints in a quart, etc. Also that the dry quart holds more than the liquid. They will make these discoveries with keen delight, whereas the mere learning of the table is meaningless repetition. So with all other lessons upon weights and measures. Make it a rule that your pupil gain his knowledge by actual contact with the things he is to learn, not by means of printed statements about them.

4. FORM STUDY.—Do not depend upon the pictures. The circles and squares, beautifully colored, may be had at small expense from any store that keeps kindergarten supplies. The pupil should, of course, cut for himself all the forms studied. The solids are inexpensive, also. Any bookseller will order them for you. The pupil may make most of them from thin pasteboard, or model them in clay. Prang's little book, "The Use of Models," and W. W. Speers' "The Study of Form," are full of helpful suggestions.

5. MATERIALS.—Colored wooden beads (5 cents a hundred) with shoe laces to string them on; colored sticks at 15 cents a thousand; inch cubes, the best of all objects for number study, and worth 25 cents a hundred; cheap horn buttons, seeds, or shells, are easily obtained. Toothpicks will do for the numeration-box, which last any ingenious teacher can make by nailing three shallow cigar-boxes upon two thin, flat pieces of pine. Pint, quart, and gallon cups, a scale-pan and weights, a yard-stick, and all other common weights and measures should be the property of every school-room. If not in yours, buy or borrow them. See that every child has his own foot-rule, and that he uses it often in measuring the floor, walls, blackboards, and other objects. The school-yard, the sidewalk, the adjoining lot, a neighbor's wood-pile, furnish you with opportunities for having your pupils really learn certain dimensions of length, breadth, and thickness. The mere *book-teaching* of such realities as form, distance, weight, number, is absurd. Teach first the thing itself; then let the knowledge be expressed in appropriate symbols.

FOUR YEARS' WORK IN NUMBER.

PART I.

CHAPTER I.

NUMBERS FROM ONE TO TEN.

LESSON I.

COPY:

One and one are two. $1 + 1 = 2.$

Two ones are two. $2 \times 1 = 2.$

*1. Lucy had a red rose and Frank gave her a white one. How many did she have then?

2. Emma has two jars with a rose in each. How many roses has she?

Give another story for $2 \times 1 = 2.$
Make a picture for $1 + 1 = 2.$

*Require all answers to problems to be in written equations.

LESSON II.

One and one and one are three. $1+1+1=3.$

Three ones are three $3\times1=3.$

Two and one are three. $2+1=3.$

COPY:

1. John has two large tops and one small one. How many tops has he in all?

2. There are three boxes on the table and a hat in each box. How many hats is that?

COPY:

Three less one is two. $3-1=2.$

Three less two is one. $3-2=1.$

1. George had three tops and gave Lewis one. How many tops did George have then?

2. There were three roses on the bush and Mary picked two of them. How many were left on the bush?

COPY AND COMPLETE:

$1+1=$	$2-1=$	$1+2=$	$3\times1=$
$2\times1=$	$2+1=$	$3-1=$	$3-2=$

LESSON III.

COPY AND COMPLETE:

$2+2=$ $4-1=$

$2\times2=$ $4-3=$

$4\times1=$ $4-2=$

1. How many hands do two girls have?

2. Maud has three large dolls and one small one. How many dolls is that?

3. She gave two dolls to her cousin. How many did she have then?

4. There are two cages in my room and two birds in each cage. How many birds in the room?

Write a story for $4-3=$?

LESSON IV.

COPY AND COMPLETE:

$5=3+$ $5-4=$

$5=4+$ $2+3=$

$5=2+$ $5-2=$

$5=1+$ $4+1=$

1. Julian caught two perch and Willie caught three. How many fishes did both boys catch?

2. Marion had five pencils and lost one. How many pencils did she have then?

3. Rosa has two cats and Ellen has twice as many. How many cats does Ellen have?

Write a story for $4+1=$?

LESSON V.

COPY AND COMPLETE:

3+3=	3×2=	6—3=
2×3=	6=5+	6—1=
2+2+2=	6=4+	⅓ of 6=

1. How many eyes do three boys have?

2. How many cakes on two plates if there are **three** cakes on each?

Walter had six marbles and lost four of them. How many did he have then?

Write a story for 5+1= ?

LESSON VI.

COPY AND COMPLETE:

Two threes and one are seven. $2×3+1=7.$

Three twos and one are seven. $3×2+1=7.$

Seven less two twos are three. $7—2×2=3.$

3+4=	7—5=	7—2×2=
5+2=	7—4=	7—3×2=
3×2+1=	7—2=	7=3×2+

1. In my drawer are three pairs of gloves and one **odd** glove. How many gloves in my drawer?

2. Lucy had two doll beds with three dolls in each **and** one doll in a chair. How many dolls does she have?

3. Kate had seven roses and gave two apiece to her **three** little friends. How many did Kate have then?

Write a story for 7—5= ?

Write one for 3×2+1= ?

LESSON VII.

COPY AND COMPLETE :

$4+4=$	$8=5+$	$8—7=$	$8—3\times2=$
$2\times4=$	$8=6+$	$8—4=$	$8=2+$
$2+2+2+2=$	$8=3+$	$8—3=$	$8=\quad\times4$
$4\times2=$	$8=7+$	$8—6=$	$8=\quad\times2$
$\frac{1}{2}$ of $8=$	$8\div4=$	$8\div2=$	$4=\quad$ of 8

1. Two pairs of cuff-buttons are how many buttons?

2. How many sides do two triangles have?

3. How many sides do two squares have? Make a picture for 2×4.

Eight apples less six apples are how many? Make a picture for $8—5$.

LESSON VIII.

Write what the picture shows.

COPY AND COMPLETE :

$3+3+3=$	$4+4+1=$	$9—2\times3=$
$3\times3=$	$2\times4+\quad=9$	$9—2\times2=$
$6+\quad=9$	$4\times2+1=$	$9—5=$
$3+\quad=9$	$9—4\times2=$	$9—7=$
$9\div3=$	$\frac{1}{3}$ of $9=$	$3=\frac{1}{3}$ of

1. Anna had three vases with three lilies in each. How many lilies in all?

2. Four of these lilies were yellow, the others were white. How many white lilies were there?

3. Ralph's father has four pairs of black horses and one white horse. How many in all?

4. Nellie brought nine figs to school and gave two apiece to Flora and Blanche. How many did she then have?

Write a story for $9—2\times4=$?

LESSON IX.

COPY AND COMPLETE:

$5+5=$	$\frac{1}{2}$ of $10=$	$10=4+$	$10-2\times2=$
$2\times5=$	$\frac{1}{2}$ of $8=$	$10=3+$	$10-2\times3=$
$2+2+2+2+2=$	$10=8+$	$10=2+$	$10-3\times3=$
$5\times2=$	$10=6+$	$10=5+$	$10-2\times4=$
$10\div2=$	$10\div5=$	$5=\frac{1}{2}$ of	$10\div\quad=5$

1. Five yoke of oxen are how many oxen?

2. Three little girls are on each of three seats and another little girl is by the table. How many all together?

3 What will two oranges cost at five cents apiece?

4. James had ten marbles and gave two apiece to Frank and Otis. How many did he have then?

Write a story for $10-2\times3=?$

Make a picture for $10-8=?$

LESSON X.

If these six cubes were put into groups of threes, how many groups would there be?

If these eight cakes were put into plates, four into each, how many plates would be needed?

How many clusters of three will these lilies make?

If these ten sticks were put into groups of five, how many groups would there be?

COPY AND COMPLETE:

$4\div2=$	$6\div2=$	$8\div2=$	$10\div2=$
$6\div3=$	$8\div4=$	$9\div3=$	$10\div5=$

LESSON XI.

REVIEW.

GIVE THE SUM:

2	1	4	8	3	8	4	1	4	2
3	6	2	2	8	8	4	4	3	6
2	2	1	1	2	3	2	5	3	1

GIVE THE RESULT:

9—2	3×8+1	½ of 2	9÷3
8—3	2×4+2	½ of 6	8÷4
10—6	3×2+4	½ of 8	6÷3
7—5	2×2+5	⅕ of 10	8÷2
9—6	4×2+1	⅓ of 9	10÷5

LESSON XII.

COPY AND COMPLETE:

    1 pint+1 pint=1 quart.
    1 pt.+1 pt.=   qt.
    2×1 pt. =   qt.
    1 qt.—1 pt.=
    ½ of 1 qt.=

ANSWER IN WRITTEN EQUATIONS:

1. Ada bought a quart of cherries and used a pint for a pie. How many pints were left?

2. There are three quart cans full of milk on the table. How many pints is that?

3. From five pints of cherries two quarts were taken. How many pints were left?

4. Allen picked three pints of berries yesterday, three pints this morning, and one pint this afternoon. How many quarts has he picked?

5 Five pint tickets will get how many quarts of milk?

6. If four quarts of cherries are put into baskets each of which holds a pint, how many baskets are used?

LESSON XIII.

COPY AND COMPLETE:

2 qt. = pt.	2 qt. — 1 pt.=
2½ qt. = pt.	3 qt. — 1 pt.=
3 qt. = pt.	7 pt. — 3 qt. =
4 qt. = pt.	4 qt. — 3 pt. =
4½ qt. = pt.	5 qt. — 7 pt. =
6 pt. = qt.	⅓ of 3 qt. =

ANSWER IN WRITTEN EQUATIONS:

1. There are six sticks on Ada's desk. What part of them should she use to lay one triangle? Ans. 3=½ of 6.

2. Maggie has eight sticks. What part of them will she use to lay a square?

3. If nine apples are shared equally by three little girls, how many is that for each child?

4. What is one-third of nine?

5. If nine apples are shared equally by three girls, how many do two of the girls get?

6. Two-thirds of nine apples are how many?

LESSON XIV.

‖ ‖ ‖ One-third of these sticks are how many?
Two-thirds of them are how many?

I have six pears for three little girls. How many is that for each child? How many for two of the children?

‖ ‖ ‖ ‖ One-fourth of these sticks are how many?
Two-fourths of them are how many?
Three-fourths of them are how many?

I have eight pears for four boys. What part of them should one boy get? What part of them should three of the boys get?

Draw six rings and put a line under one-third of them.

Draw six triangles and put a line under two-thirds of them.

Show by a picture one-fourth of eight.

COPY AND COMPLETE:

½ of 4=	⅓ of 9=	¼ of 4=
⅓ of 6=	⅔ of 9=	¾ of 4=
⅙ of 6=	⅓ of 3=	¼ of 8=
⅔ of 6=	⅔ of 3=	¾ of 8=

LESSON XV.

ANSWER IN WRITTEN EQUATIONS:

1. Mary carried two five-cent pieces to the store and bought three cents' worth of tape. What change did she get?

2. Ruth has to stay in school six hours. When one-third of the time is past, how much longer must she stay?

3. John had nine lambs and sold one-third of them at $2 apiece. How many did he sell? What did. he get for them?

4. Two squares have how many more sides than one triangle?

5. A spider has how many more legs than a fly?

6. Sarah put eight shoes into the shoe-bag. If there is a pocket for each pair, how many pockets are filled?

7. Ten sticks will lay how many squares and what part of another?

8. Ten sticks will lay how many triangles and what part of another?

9. Jane picked five quarts of berries and sold seven pints. How many pints did she have then?

10. Two baskets with three pints of berries in each contain how many quarts?

LESSON XVI.

A SQUARE.   **A CIRCLE.**

Draw these figures. Copy neatly and complete.

The Square and the Circle.

1. The square is a surface. The circle is a surface.

2. The square has —— edges. The circle has —— edge.

3. The square has —— corners. The circle has —— corner.

4. The edges of the square are equal. The corners are square corners.

This clock face is circular. How many things do you see in the school-room that are circular?

What do you think of at home that is circular?

When you go home cut out two circles and two squares.

LESSON XVII.
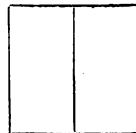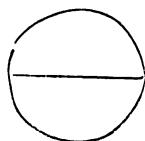
COPY AND COMPLETE:

$\frac{1}{2} + \frac{1}{2} =$
$2 + \frac{1}{2} =$
$1 - \frac{1}{2}, - \frac{1}{2} =$
$1 \div \frac{1}{2} =$

Draw three squares; shade one half of each.

ANSWER IN EQUATIONS:

1. If I break two cakes into halves, how many pieces will there be?

2. There were two pies in the pantry and Rob ate half of one of them. What remained?

3. George serves a half melon on each of ten plates. How many melons were cut?

4. John has seven half dollars. How much money is that?

Write a story for $4 \times \frac{1}{2} = ?$

LESSON XVIII.
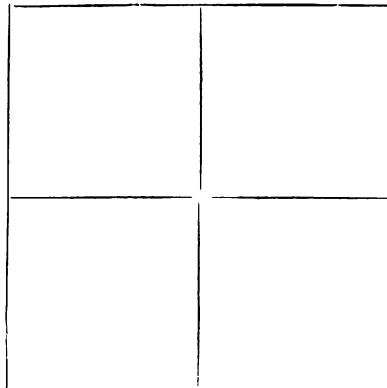
Draw a two-inch square. Lay it off into inch squares.

ANSWER IN COMPLETE SENTENCES:

1. How many lines bound the two-inch square?
2. How many inches long is the boundary?
3. How many inch squares in the two-inch square?
4 What part of the large square is one of the small squares?
5. What part of it are two of the squares?
6. What part of it are three of the squares?
7. How much larger is a two-inch square than a one-inch square?

Draw a rectangle one inch wide that will contain as many square inches as a two-inch square.

LESSON XIX.
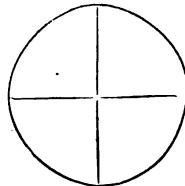
COPY AND COMPLETE:

$\frac{1}{4}+\frac{1}{4}+\frac{1}{4}+\frac{1}{4}=$

$4\times\frac{1}{4}=$

$1-\frac{1}{4}=$

$1\div\frac{1}{4}=$

$\frac{2}{4}+\frac{2}{4}=$

$2\times\frac{2}{4}=$

$1-\frac{2}{4}=$

$1\div\frac{2}{4}=$

$1-\frac{3}{4}=$

$\frac{2}{4}+\frac{1}{4}=$

$\frac{3}{4}-\frac{1}{2}=$

$\frac{1}{2}-\frac{1}{4}=$

1. How many quarters in two circles?

2. How many quarters in one circle and the half of another?

3. A half-circle and a quarter-circle are how many fourths of a circle?

4. There is a quarter of an orange on each of Katie's eight doll saucers. How many oranges must have been cut?

5. If I cut two melons into fourths, how many pieces shall I have?

Write a story for $\frac{1}{2}-\frac{1}{4}=$?

LESSON XX.
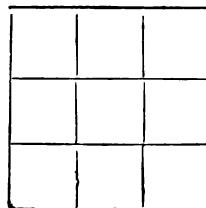
Draw a three-inch square. Lay it off in square inches.

1. How many inches long is each of the four boundary lines ?

2. How many one-inch squares in the lower row ?

8. How many one-inch squares in the middle row ?

4. How many in the upper row ?

5. A three-inch square contains how many inch squares ?

6. How many of these inch squares have only one edge in the bounding edge ?

7. How many have two edges in the bounding edge?

8. How many have no edge in the boundary ?

9. How many of the inch squares touch the square inch in the centre by edges ?

10. Three of the inch squares are what part of the whole square ?

11. Two rows of inch squares are what part of the whole square ?

12. Six square inches are what part of nine square inches ?

13. How many more square inches in a three-inch square than in a two-inch square ?

14. One square inch is what part of the large square.

15. Four square inches are what part of it ?

LESSON XXI.

Copy.   Learn to spell all the words.

    1. Parallel.   3. Horizontal.   5. Curved.

    2. Vertical.   4. Slanting.   6. Straight.

1. Parallel vertical lines.

2. Parallel horizontal lines.

3. Parallel slanting lines.

4. Parallel curved lines.

DRAW:

    1. A vertical line an inch long.

    2. A horizontal line two inches long.

    3. A slanting line three inches long.

    4. Two vertical lines that are parallel.

    5. Two parallel horizontal lines.

    6. Three parallel slanting lines.

    7. Two parallel curved lines.

    8. Three lines slanting in different directions.

CHAPTER II.

NUMBERS FROM TEN TO FIFTEEN.

LESSON XXII.

REVIEW.

GIVE RESULT QUICKLY:

2+5	6—4	7—3
3+6	7—2	9—2
4+3	8—4	10—4
6+4	5—3	8—5
2+7	9—6	10—7
8+2	10—8	10—2
5+4	9—4	10—3
2+6	8—6	10—6

3×3	$\frac{1}{2}$ of 6	$\frac{1}{3}$ of 9
2×4	$\frac{1}{4}$ of 8	$\frac{2}{3}$ of 9
5×2	$\frac{1}{2}$ of 10	$\frac{1}{4}$ of 4
10÷2	$\frac{1}{3}$ of 6	$\frac{1}{4}$ of 8
8÷4	$\frac{2}{3}$ of 6	$\frac{3}{4}$ of 8
6÷3		

COPY AND COMPLETE:

5+5+1=	5×2+ =11	11=7+
2×5+1=	11=5×2+	11—7=
4+4+ =11	11=6+	11—8=
2×4+ =11	11=9+	11—3=
8+3+3 =11	11= + 8	11—6=
11=3×3+	11= +10	11—9=

ANSWER IN WRITTEN EQUATIONS:

1. Two squares and a triangle have together how many sides?

2. Arthur has a dime and a cent. George has three two-cent pieces. Arthur has how many more cents than George?

3. Mary has eleven cents in three coins. What three?

4. Eleven pints are how many quarts?

5. How many triangles and what part of another can be laid with eleven sticks?

Write me a story for 11—4= ?

LESSON XXIII.

Four pineapples are what part of 12 pineapples?
Two-thirds of 12 pineapples are how many?
Four is what part of 12?
Eight is what part of 12?

Three peaches are what part of 12 peaches?
Three-fourths of 12 peaches are how many?
Three is what part of 12?
Nine is what part of 12?

Place these shells in pairs. How many pairs will there be?

Separate the shells into 2 equal groups. How many in each?

How many sixes in 12?   How many fours?   How many threes?   How many twos?

COPY AND COMPLETE:

$6+6=$	$3\times4=$	$12-9=$	$2+\ \ =12$
$2\times\ \ =12$	$12\div4=$	$12-8=$	$8+\ \ =12$
$12\div6=$	$\frac{1}{3}$of $12=$	$12-5=$	$8+\ \ =12$

LESSON XXIV.

COPY AND COMPLETE:

4 quarts = 1 gallon.   2 gallons =   quarts.

2 qts. +   = 1 gal.   2½ gals. =

2 qts. = ½ of   3   gals. =

1 qt. = ¼ of   3   gals. — 1 qt. =

¾ of 1 gal. =   2 gals. — 3 qts. =

ANSWER IN WRITTEN EQUATIONS:

1. Two quarts and a half gallon are equal to how many quarts?

2. A pail that contains 3 gallons of blackberries will fill how many quart baskets?

3. How many half-gallon jars can be filled from a kettle containing 10 quarts of syrup?

4. John gathered 3 gallons of strawberries and sold 9 quarts. How many quarts were left on his hands?

Write a story for 2 gals. + 2 qts. = ?

LESSON XXV.

Copy and learn to spell the names of months of the year.

January.	April.	July.	October.
February.	May.	August.	November.
March.	June.	September.	December.

COMPLETE:

January is the ———— month.

———— is the second month.

The fourth month is ————.

The ninth month is ————.

The year is half gone at the end of ————.

After August, there are ———— more months.

One-fourth of the year is gone at the end of ————.

Three-fourths of the year is gone at the end of ————.

Thanksgiving comes in ————.

———— comes in December.

Nine months are ———— fourths of the year.

LESSON XXVI.

COMPLETE:

12 inches=1 foot.	$\frac{2}{3}$ ft.=
6 in. =	$\frac{1}{2}$ ft.+$\frac{1}{3}$ ft.=
2×6 in. ==	1 ft.—3 in. =
1 ft.÷6 in. =	5 in. + =1 ft.
$\frac{1}{2}$ ft.+6 in. =	10 in. + =1 ft.
$\frac{1}{4}$ ft.=	$\frac{2}{3}$ ft. + =12 in.

ANSWER IN WRITTEN EQUATIONS:

1. Grandma had a dozen ginger cakes in the cupboard, and gave four of the children two apiece. How many were left?

2. Mamie has five dolls sitting in chairs, and three beds with two dolls in each bed. How many dolls has she?

3. There are a dozen fine roses in the basket, and one-third of them are John's. The rest are Lucy's. How many has she?

4. Rob has a broad piece of elastic a foot long. He gave George three-fourths of it. How many inches long was the piece he gave away?

LESSON XXVII.

TRY TO THINK OF:

1. Ten splints in a bundle, three splints beside them. How many do you see in all?

2. A dozen eggs in a basket, one egg outside. How many?

3. Nine lilies on a waiter, four in a vase. How many?

4. Annie with five violets in each hand and three pinned on her dress. How many?

5. Four black ducks, four white ones and five little ducks swimming to them. How many?

Make a picture of 11 cherries in one bunch and 2 in another. Six stars and enough more to make 13.

COPY AND COMPLETE:

2×6+ =13.	4×3+$\frac{1}{3}$ of 3=
2×5+ =13.	2×6$\frac{1}{2}$=
13=4×3+	$\frac{1}{2}$ of 13=
13=6×2+	13 days—4 days=
18—7=	6 qt.+ ? =13 pt.
13—5=	13 mo. —$\frac{1}{2}$ yr.= mo.

LESSON XXVIII.

ANSWER IN WRITTEN EQUATIONS:

1. Percy keeps his 14 marbles in two bags with the same number in each. How many in each ?

2. I saw seven pairs of Plymouth Rock chickens at the frir. How many chickens was that?

3. Thirteen geese and one gander are how many fowls ?

4. A dozen hen eggs and two turkey eggs are how many eggs ?

5. Fourteen boys are on the play-ground. Three of them are resting under a tree. How many at play ?

6. Maggie had 14 splints and made from them one bundle of ten. How many single splints were left?

7. It takes four pieces of wood for a picture frame and Roy has carved enough for three frames and the half of another. How many pieces has he carved ?

8. Think of four stems with three yellow cherries on each. How many more cherries would make fourteen?

9. What coin must be put with 4 two-cent pieces and a one cent piece to make 14 cents ?

10. There are 14 spools in two thread boxes. One box has 8 spools in it. How many in the other ?

Write a story for

$$5+9-3= ? \qquad 2\times7-3= ?$$
$$14-9= ? \qquad \tfrac{1}{2} \text{ of } 14= ?$$

LESSON XXIX.

COPY AND LEARN TO SPELL THESE WORDS:

1. Sunday.   4. Wednesday.   7. Saturday.
2. Monday.   5. Thursday.   8. Christmas Day.
3. Tuesday.   6. Friday.   9. Thanksgiving Day.

COPY AND COMPLETE:

7 days=1 week.   2 wk. =   da.
1 wk.+2 da. =   da.   2 wk. —4 da. =
1 wk.+4 da. =   da.   2 wk. —9 da. =
1 wk.+6 da. =   da.   2 wk. —8 da. =

ANSWER IN WRITTEN EQUATIONS:

1. When Tuesday is past, how many days of the week are yet to come?

2. How many school days in 2 weeks?

3. If I buy a quart of milk every day, how many gallons will that be in a week?

4. If I buy a pint of milk every day, how many quarts will that be in 2 weeks?   How many gallons?

5. Rufus spent a week and three days with his uncle and four days at his aunt's.   How long was he away from home?

Write a story for 1 wk.—2 da. =? da.

LESSON XXX.

THE EQUAL NUMBERS IN 10.

$$5+5=10 \qquad\qquad 2+2+2+2+2=10$$

THE UNEQUAL NUMBERS IN 10.

$$1+9=10 \qquad\qquad 3+7=10$$
$$2+8=10 \qquad\qquad 4+6=10$$

Now write the equal numbers in 12. In 14. In 15. Write the unequal numbers in 12, 14, 15.

ANSWER IN WRITTEN EQUATIONS:

1. Think of 3 stems with 5 leaves on each? How many leaves do you see?

2. Think of 5 clusters of yellow lilies, 3 in a cluster. How many lilies?

3. Fifteen sheets of colored paper are placed in equal layers according to color, green, yellow, and blue. How many sheets in each layer?

4. There are 5 guinea fowls in 1 coop and twice as many in another. How many in both coops?

5. Betty had 15 cakes to bake and has made only 9. How many more must she bake?

6. Fred says, "I have 8 marbles;"Lewis says, "I lack 1 of having that many." How many marbles have they together?

7. Two weeks and 1 day are how many days?

8. One dozen eggs in one basket and one-fourth as many in another. How many in both?

9. Ella had 6 cents and sold 3 pears for 3 cents apiece. How much money had she then?

10. How many yards of ribbon worth 10 cents a yard can she buy with her money?

Write a problem for $15 \div 5 = ?$

Another for $15 - 3 \times 4 = ?$

LESSON XXXI.
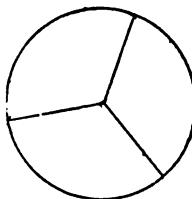
COMPLETE :

One-third compared with one.   One-third with two-thirds.

$$\tfrac{1}{8}+\tfrac{1}{8}+\tfrac{1}{8}=1$$
$$8\times\tfrac{1}{8}=$$
$$1-\tfrac{1}{8},-\tfrac{1}{8},-\tfrac{1}{8}=$$
$$1\div\tfrac{1}{8}=$$

$$\tfrac{1}{8}+\tfrac{1}{8}=\tfrac{2}{8}$$
$$2\times\tfrac{1}{8}=$$
$$\tfrac{2}{8}-\tfrac{1}{8},-\tfrac{1}{8}=$$
$$\tfrac{2}{8}\div\tfrac{1}{8}=$$
$$\tfrac{1}{8}=\tfrac{1}{2}\text{ of}$$

1. I cut a melon into 3 equal parts and put twice as much on father's plate as on mother's. What part of a melon on each plate?

2. If one-third of a pie is enough for a plate, how many pies must Bettie make for 9 plates?

3. Draw a 3-inch square. Divide it into thirds. How many square inches in one of the thirds?

4. How many square inches in two-thirds of the square?

5. If a housekeeper uses one-third of a cheese every week, how many cheeses will she use in 12 weeks?

6. Walter's little pail holds one-third as much as Jim's large one. Walter has filled his pail 6 times with berries. How often could he have filled Jim's pail in the same time?

LESSON XXXII.

ANSWER IN WRITTEN EQUATIONS:

1. My tuberose has had a new bloom on it every day for two weeks. How many blooms in all?

2. Three violets have how many more petals than one lily?

3. Willie made 15 pop-corn balls and colored two-thirds of them pink. How many were white?

4. Lewis and Harry found 13 bird nests, and 7 of them were English sparrow nests, How many of other birds?

5. Dinah uses a half-dozen eggs a day. How many will she use in five days?

6. Milly has been absent from school 4 days in the last 3 weeks. How many days has she been present?

7. Janie is to be away from home a year. She has spent one-third of the year in New York and has been 5 months in Boston. How much longer is she to stay from home?

8. John's white rabbits are a year and three months old, and Ned's are 7 months old. How much older are John's?

9. Willie had a dozen bird eggs. He sold one-third of them for 2 cents apiece, and one egg (a crow's) for 5 cents. What did he get for these? How many eggs had he left?

10. Maggie picked a gallon of blackberries and 3 quarts of strawberries. She sold them in little birch baskets that held a pint each. How many baskets did she use?

LESSON XXXIII.

COPY NEATLY AND COMPLETE:

$12 \div 3 = ?$ Twelve cents will buy how many apples at 3 cents apiece?

$\frac{1}{3}$ of $12 = ?$ If 3 apples cost 12 cents, what are they apiece?

$\frac{2}{3}$ of $15 = ?$ If 15 roses are gathered for 3 bouquets of the same size, how many roses will be in 2 of them?

$\frac{1}{2}$ of $(10+4) = ?$ Ben got 10 water lilies this morning and 4 at noon, and put them into two dishes, the same number in each. How many in each dish?

WRITE STORIES FOR THESE:

$15 \div 5 = ?$	$\frac{1}{2}$ of $(7+5) = ?$
$\frac{1}{3}$ of $9 = ?$	$\frac{3}{4}$ of $12 = ?$

LESSON XXXIV.

LEARN TO ADD THESE COLUMNS QUICKLY:

2	2	4	6	2	5	4
3	3	7	3	3	4	3
5	4	1	3	5	4	2
5	4	2	3	2	3	6
—	—	—	—	—	—	—

GIVE THE RESULTS RAPIDLY:

10—7	12—7	6+7	7+8
11—8	12—4	9+4	8+6
11—6	12—5	4+7	3+11
12—9	12—3	8+8	9+6

14—8	13—7	15—11	15—9
14—5	13—9	15—6	15—12
14—6	13—8	15—8	15—7
14—9	13—5	15—5	15—3

3×4	3×5	$\frac{1}{3}$ of 12	$\frac{1}{4}$ of 12
6×2	4×3	$\frac{2}{3}$ of 12	$\frac{3}{4}$ of 12
7×2	5×3	$\frac{1}{3}$ of 15	$\frac{2}{3}$ of 15

LESSON XXXV.

FORM LESSON.

COPY NEATLY AND COMPLETE:

Surfaces.

1. The blackboard has a plane surface.

2. The top of my desk is a ——— ———

3. The surface of a sphere is curved.

Write the names of all the plane surfaces in the school-room.

Write the names of five things that have curved surfaces.

LESSON XXXVI.
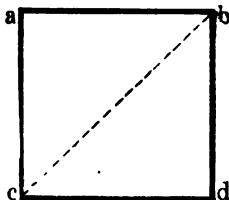
AN INCH SQUARE.

Draw a 2-inch square. Join with a straight line the upper right corner and lower left corner. Letter as in the inch square.

Write your answers in complete sentences.

1. What line is opposite c d ?
2. What line is opposite a c ?
3. What line is parallel to the base line ?
4. How many vertical lines are in the figure ?
5. How many horizontal lines ?
6. What kind of line is b c ?
7. How many lines are of the same length ?
8. Which is the longest line ?
9. What part of the square is each triangle ?
10. How many right angles in the triangle a b c ?
11. How many acute angles in the triangle a b c ?
Lay off your square into one-inch squares.
12. How many inch squares in the triangle b c d ?
13. How many halves of an inch square ?
14. How many square inches do you see in the two-inch square ?
15. How many of these are cut in half by the line b c ?

CHAPTER III.

NUMBERS FROM SIXTEEN TO TWENTY.

LESSON XXXVII.
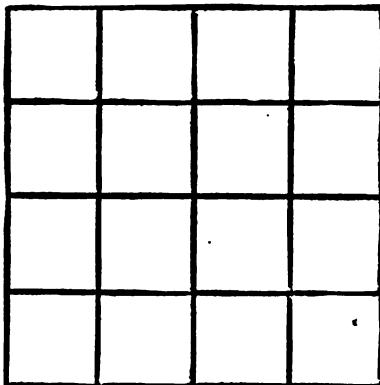
*Draw a four-inch square.   Lay it off into inch squares. Write answers to these questions:

1. How many inch squares in tne 4-inch square?
2. How many square inches in one-half of the square?
3. How many square inches in one-fourth of the square?
4. How many square inches in three-fourths of the square?
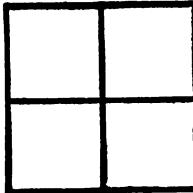
Draw a two-inch square.   Lay it off in inch squares.
1. How many square inches in a two-inch square?
2. How many more square inches in a 4-inch square than in a 2-inch square?

COPY AND COMPLETE:

$$4 \times 4 = \qquad \tfrac{1}{4} \text{ of } 16 = \qquad \tfrac{3}{4} \text{ of } 16 =$$
$$2 \times 8 = \qquad \tfrac{1}{2} \text{ of } 16 = \qquad 16 - 12 =$$

*TO THE TEACHER.—Explain that the diagram is really a 2-inch square. The child must rule on his slate a 4-inch square.

LESSON XXXVIII.
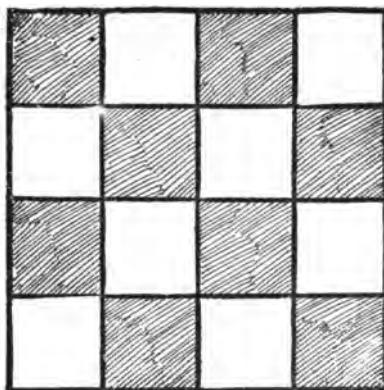
Play that this picture is a piece of paper four inches square, laid off into red and black squares.

How many little squares of each kind?

How many square inches in the 4-inch square?

How many pieces of paper 2 inches square would cover the 4-inch square?

If you lay three 2-inch squares upon the 4-inch square what part will be covered?

Twelve square inches are what part of a 4-inch square?

Lay a 3-inch square upon this 4 inch square, and how many squares are covered? How many are not covered?

How many of the little squares in the 4 inch square have 2 sides in the bounding line?

How many have only 1 side in the bounding line?

How many have no side in the boundary?

How many rectangles 2 inches by 4 inches do you see in this square?

Write the equal numbers that make 16.

Write the unequal numbers that make 16.

LESSON XXXIX.

COMPLETE AND LEARN:

12=2×	13=5+	15=7+
14=2×	18=9+	15=9+
16=2×	18=6+	15=11+
12=3×	14=5+	15=8+
15=3×	14=8+	16=12+
16=4×	14=4+	16=7+
12=4×	14=2+	16=5+

Write the equal numbers in 14; in 16. Write the unequal numbers in 14; in 16.

ANSWER IN WRITTEN EQUATIONS:

1. There were four black ponies and 6 pairs of white ponies in the parade. How many ponies in all?

2. There were in our yard 2 rows of trees with 8 in each row, but 7 trees have died; how many are living?

3. Ada has 4 coins in her purse which together make 16 cents. Three of the coins are 2-cent pieces; what is the other coin?

4. Robert had 16 bananas. He ate one and gave the others to three little girls. How many bananas was that for each little girl if they shared alike?

5. With 16 cents how many popcorn balls at 2 cents apiece can Fred buy?

Write a story for $\frac{1}{4}$ of 16=?

Write one for 16—3×5=?

COPY AND COMPLETE:

16=9+	2 wk.+2 da.=	16 da.—1 wk.=
16=5+	16 mo.—1 yr.=	16 in.—1 ft.=
16=12+	4 gal.=　　qt.	1 ft.+4 in.=
16=7+	2 gal.=　　pt.	$\frac{3}{4}$ of 16 cts.=
16=3+	4 gal.—9 qt.=	16—3×3=

LESSON XL.

FORM LESSON.
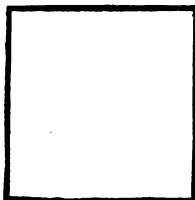
The Oblong Rectangle.

The Square Rectangle.

On your slate draw a square 4 inches on a side; then draw an oblong rectangle half as long as the square.

COPY AND COMPLETE:

THE SQUARE AND THE OBLONG.

I. *Likenesses.*

1. Each is a plane surface.

2. Each has ——— sides.

3. Each has ——— angles.

4. All the angles of the square are ——— angles.

All the angles of the oblong are —— angles.

5. The square has —— pairs of opposite lines.

The oblong has—— pairs of opposite lines.

II. *Differences.*

1. All the sides of the square are ——— In the oblong only the ———— sides are equal.

Write any other differences you may see.

What square surfaces do you see in the school-room? What oblong surfaces?

LESSON XLI.

ANSWER IN WRITTEN EQUATIONS:

1. Eight pairs of white horses and one black horse are how many horses?

2. In Mr. Wooten's show-case are 8 boxes with 5 pearl-handled knives in each, and another box with 2 ivory-handled knives in it. How many in all?

3. How many squares and what part of another can be laid with 17 sticks of the same length?

4. There are 17 splints on my desk, 10 of which are in a bundle. How many single splints?

5. Mary had a dime, a nickel and two 1-cent pieces. She bought 3 figs at 3 cents apiece. How much money had she then?

6. Two pies cut into fourths, and 3 pies cut into thirds, will make how many pieces?

7. If 11 of these pieces are eaten, how many will be left?

8. Seventeen geese are in the meadow, 8 of which are old ones. How many young geese are there?

9. There were 9 blue plates in the cupboard and 8 white ones. Katie took 12 out. How many plates were left?

Write a story for $17 - 4 \times 4 = ?$

LESSON XLII.

COPY AND COMPLETE:

$17 = 4 \times 4 +$	16 pt. = qt.	$17 - 6 =$
$17 = 2 \times 8 +$	17 pt. = qt.	$17 - 8 =$
$17 \div 4 =$	17 mo. —1 yr.=	$17 - 5 =$
$17 \div 8 =$	17 in.—1 ft.=	$17 - 9 =$
$8\frac{1}{2} \times 2 =$	17 da.—2 wk.=	$17 - 14 =$
$17 \div 2 =$	17 qt. —4 gal =	$17 \div 3 =$

LEARN TO ADD QUICKLY:

2	3	1	6	2		7	8	4	5
2	3	4	3	3		1	4	4	4
2	3	4	4	2		5	2	1	2
2	3	4	3	5		4	7	7	6
2	3	4	1	5		—	—	—	—
—	—	—	—	—					

LESSON XLIII.
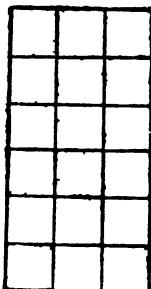
Draw a rectangle 6 inches long and 3 inches wide. Lay it off in inch squares.

How many vertical rows of squares?

How many square inches in each vertical row?

How many square inches in the rectangle?

One vertical row of squares is what part of the rectangle?

Two vertical rows are how many square inches?

Two-thirds of 18 square inches are how many square inches?

How many squares in each horizontal row?

How many horizontal rows?

Each horizontal row is what part of the rectangle?

One-sixth of 18 square inches are how many square inches?

Two-sixths of the rectangle are how many square inches?

Three-sixths are how many?

Which has more square inches, one-half of the rectangle or three-sixths of it?

Five-sixths of the rectangle are how many square inches?

A strip of paper 1 inch wide and 6 inches long will cover what part of the rectangle?

How many strips 1 inch wide and 6 inches long will cover all of it?

A strip 1 inch by 3 inches will leave how many square inches uncovered?

A strip 2 inches by 3 inches will cover what part of the rectangle?

A piece 4 inches by 3 inches will cover how many sixths of the rectangle?

LESSON XLIV.
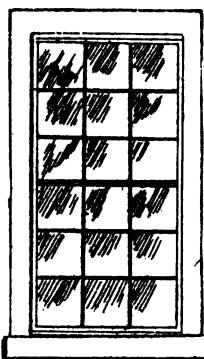
DRAW THIS WINDOW:

How many panes in the upper sash? In the lower?

In the vertical row on the left?

In the right vertical row and the middle vertical row together?

How much longer is each vertical than each horizontal row?

How many more horizontal rows than vertical?

What part of the window is one of the vertical rows?

What part of the window is one of the horizontal rows?

Which has more panes, one vertical row or two horizontal rows?

Which has more panes, one-third of the window or two-sixths of it?

Cover two-thirds of the window. How many panes are left?

Cover four-sixths of it. How many panes are uncovered?

How many panes have two edges in the margin?

How many have only one edge in the margin?

How many have no edge in the margin ?

If only the middle pane in each sash is broken, how many panes are unbroken?

LESSON XLV.

COMPLETE:

$\frac{1}{2}$ of 18=	6×3 ct. =
$\frac{1}{3}$ of 18=	18 cts.—1 dime=
$\frac{2}{3}$ of 18=	1 ft. 6 in.—13 in. =
$\frac{1}{6}$ of 18=	17—(3+5)=
$\frac{5}{6}$ of 18=	$\frac{1}{2}$ of 1 ft. 6 in. =

ANSWER IN WRITTEN EQUATIONS:

1. Which will cost more—2 pounds of stick candy at 9 cents a pound, or a pound and a half of lemon drops at 10 cents a pound?

2. Maude has 2 coops with 9 chickens in each, and Alice has 7 black and 6 white chickens. How many more has Maude?

3. George has 5 white geraniums and 13 red ones with which to border a walk. How many must he plant on each side?

4. Maria made 7 seed-cakes and 9 frosted ones to put in the lunch basket which her 4 brothers take to school. How many cakes for each boy?

5. There are 18 geese, young and old, in the meadow. The 5 old ones are on the bank, and the young ones swimming in the water. How many do you see in the water?

6. There are 14 pigeons sunning themselves on the roof, and 2 pairs of squabs in the pigeon house. How many in all?

WRITE STORIES FOR:

$$6×3—(2+5)= ?$$
$$\tfrac{1}{3} \text{ of } (8+7)= ?$$

LESSON XLVI.

GIVE THE DIFFERNЬCE:

16— 9	17— 9	18— 9
16— 7	17—12	18— 8
16— 8	17— 8	18— 4
16— 5	17—10	18— 6
16—10	17— 5	18—12
16—12	17—15	18—11
16—14	17— 3	18—15

GIVE THE SUM:

1	11	12	2	12	3	13	11	2	12	13
2	2	1	2	2	1	1	3	3	3	2

3	13	4	14	12	5	15	12	4	13	14
3	3	2	2	4	2	2	5	3	4	3

1	11	16	5	15	13	4	14	2	12	16
6	6	1	3	3	5	4	4	6	6	2

7	17	11	4	14	15	6	16·	13	2	17	12
1	1	7	5	5	4	3	3	6	7	2	7

3	9	6	8	8	8	8	5	7	6	8
2	2	2	2	6	5	2	5	3	5	8
7	3	4	7	3	4	6	3	5	3	3

LESSON XLVII.
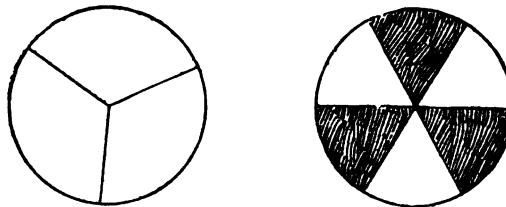
Each of these circles is 1 inch in diameter.
One circle is divided into thirds, the other into sixths.
Look at the picture as you copy and complete.

$$1 = \frac{}{3} \qquad \frac{2}{6} = \frac{}{3} \qquad \frac{1}{3} - \frac{1}{6} = \frac{}{6} \qquad \frac{2}{3} + \frac{1}{6} = \frac{}{6}$$

$$1 = \frac{}{6} \qquad \frac{4}{6} = \frac{}{3} \qquad \frac{5}{6} - \frac{2}{3} = \frac{}{6} \qquad \frac{2}{3} + \frac{2}{6} =$$

$$\frac{1}{3} = \frac{}{6} \qquad \frac{2}{3} - \frac{1}{6} = \frac{}{6} \qquad \frac{1}{3} + \frac{1}{6} = \frac{}{6} \qquad \frac{1}{2} + \frac{3}{3} =$$

How many thirds in this rectangle? How many sixths?
How many times larger is one-third of it than one-sixth?
How does ⅔ of the rectangle compare in size with ⅙ of it?
The entire rectangle is how many times as large as one-third of it? As one-sixth of it?
How many sixths in two-thirds of it?
If two-thirds be erased, how many sixths will remain?

LESSON XLVIII.
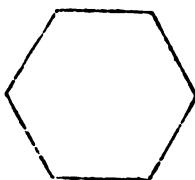
Two sides of this hexagon are what part of the boundary ?   Five sides are what part of the boundary ?

One-third of the boundary is how many sides ?   Two-thirds of the boundary ?

If each of two puddings is cut into sixths how many pieces will there be ?

Draw a rectangle 1 inch wide and 3 inches long.   What is ⅛ of this rectangle ?

Draw a rectangle 2 inches wide and 3 inches long.   What is ⅓ of this rectangle ?   What is ⅔ of it ?

Draw another rectangle 2 inches wide and 3 inches long. What is ⅙ of this rectangle ?   What is ⅚ of it ?

How many inches longer is ⅓ of a foot than ¼ of a foot ?

How much longer is ⅔ of a foot than ½ of a foot ?

How many times greater is ⅓ of 18 than ⅙ of 18 ?

How many more months in ⅛ of a year than in ⅙ of a year ?

What is the difference between five-sixths of a year and 7 months ?

Between five-sixths of a year and ⅔ of a year ?

Two pies cut into thirds and two cut into sixths make how many pieces ?

MAKE PROBLEMS FOR THESE:

$$6 \div \tfrac{1}{8} = ? \qquad\qquad 2 - \tfrac{1}{8} = ?$$

LESSON XLIX.

1. Try to see-nine couples of boys marching and the captain in front. How many boys?

2. Six bunches of white lilies, 3 in a bunch, and one large red lily. How many ?

3. Enough shoes for 4 horses, and 3 shoes besides. How many ?

4. Three 5-cent pieces and four 1-cent pieces are how much money ?

5. How many more flowers will make 19 ?

6. Jessie has a dozen eggs. How many more must she find to have 19 ?

7. Walter is 19 years old and his brother is 8 years younger. How old is his brother ?

8. I set 10 plants in each of two rows, and one of the plants died. How many lived ?

9. Nineteen sticks will lay how many triangles ?

10. Nineteen sticks will lay how many hexagons ?

Make a problem for $4 \times 3 + ? = 19$

One for $19 - 2 \times 7 = ?$

LESSON L.

STUDY TILL YOU CAN ANSWER QUICKLY:

$1 + ? = 9$	$3 + ? = 9$	$6 + ? = 18$
$1 + ? = 19$	$3 + ? = 19$	$12 + ? = 18$
$11 + ? = 19$	$13 + ? = 19$	$18 - 8 = ?$
$2 + ? = 9$	$4 + ? = 9$	$7 + ? = 16$
$2 + ? = 19$	$4 + ? = 19$	$16 - 9 = ?$
$12 + ? = 19$	$14 + ? = 19$	$17 - 8 = ?$

GIVE THE PRODUCT:

6	4	5	3	3	2	2	7	6
3	4	2	6	5	9	8	2	2

DIVIDE :

$3 \overline{)18}$ $4 \overline{)12}$ $4 \overline{)16}$ $3 \overline{)15}$ $3 \overline{)18}$ $3 \overline{)19}$ $5 \overline{)15}$

$4 \overline{)14}$ $4 \overline{)17}$ $4 \overline{)19}$ $2 \overline{)18}$ $2 \overline{)19}$ $4 \overline{)15}$ $8 \overline{)16}$

LESSON LI.

TWENTY.

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o o o o
o o o o
o o o o
o o o o
o o o o
```

COMPLETE :

3×4	2×5	2×10
4×4	3×5	$20\div10$
5×4	4×5	10×2
$20\div4$	$20\div5$	$20\div2$

$\frac{1}{4}$ of $20=$	$\frac{1}{5}$ of $20=$	$\frac{1}{2}$ of $20=$
$\frac{2}{4}$ of $20=$	$\frac{2}{5}$ of $20=$	$\frac{1}{10}$ of $20=$
$\frac{3}{4}$ of $20=$	$\frac{4}{5}$ of $20=$	$\frac{9}{10}$ of $20=$

Write the equal numbers in 20. Write the unequal numbers in 20.

COMPLETE THESE PROBLEMS :

$\frac{1}{5}$ of $20=$? If 20 cakes are shared equally by 5 children, how many will that be for each child?

$\frac{3}{5}$ of $20=$? If 5 yards of velvet cost 20 dollars, what will that be for 3 yards?

$20\div10$ =? How many mocking-birds at 10 dollars apiece can be bought for 20 dollars?

$20\div4=$? 20 cubes laid in groups of 4 will make how many groups?

WRITE PROBLEMS FOR :

$\frac{1}{4}$ of $20=$?	$20\div2=$?
$\frac{3}{4}$ of $20=$?	$20\div5=$?

LESSON LII.
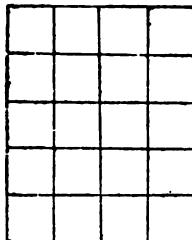
Draw a rectangle 4 inches wide and 5 long. Lay it off in inch squares.

How far is it along the boundary line from the upper left hand corner to the lower right hand corner?

How long is the whole bounding line?

How much longer is the bounding line than that of a 4-inch square?

A paper 2 inches square will cover how many square inches of this rectangle? It will leave how many uncovered?

A paper 3 inches square would leave how many square inches uncovered?

A 4-inch square will cover what part of the rectangle?

A strip 1 inch wide, and 5 inches long, will leave uncovered how many squares?

Two such strips will cover what part of the figure?

COMPLETE :

$10 = \frac{}{}$ of 20	$15 = \frac{}{}$ of 20	$12 =$? of 20
$5 = \frac{}{}$ of 20	$4 = \frac{}{}$ of 20	$16 =$? of 20
$10 = \frac{}{}$ of 20	$8 = \frac{}{}$ of 20	$2 =$? of 20

LESSON LIII.

ADD RAPIDLY:

3	4	5	2	5	2	1	5	5
3	4	5	3	4	4	2	4	3
3	4	5	4	3	3	3	3	4
3	4	5	2	2	2	6	3	4
3	4	5	3	6	7	8	5	9

ANSWER IN WRITTEN EQUATIONS:

1. Twenty splints will make how many bundles of 10?

2. If Charlie carries 20 cents to the store, how many tops can he buy at 9 cents each, and what change will he receive?

3. Twenty quarts of fruit will fill how many gallon jars?

4. Janie set out 2 rows of geraniums, 7 in each row, and another row that lacked 1 of having that many. How many geraniums in all?

5. Twenty sticks will lay how many hexagons and what part of another?

6. Twenty panes are enough for how many windows and what part of another, if 6 are used in a window?

7. How long is a rectangle that is 4 inches wide and contains 20 square inches?

8. Twenty sticks will lay how many triangles and what part of another?

9. Rachel baked 20 cakes, and sent a dozen to Emma. How many did she keep?

10. Eddie and Ralph together have 20 chickens, and Ralph has 1 more than Eddie. How many chickens does each boy have?

LESSON LIV.

ODD OR EVEN.

Write the even numbers through 10.

In another column write the odd numbers through 11.

How many even numbers on the clock's face?

Write the even numbers from 10 through 20.

Write the odd numbers from 11 through 19.

In one column write the days of the week that have an even number of letters in them.

Write those which have an odd number of letters.

Write your name. Has it an odd or an even number of letters?

Copy neatly the names of the months of the year, and write after each "Odd," or "Even," according to the number of letters in each.

1. January,	5. May,	9. September,
2. February,	6. June,	10. October,
3. March,	7. July,	11. November,
4. April,	8. August,	12. December.

COMPLETE :

$\frac{1}{2}$ of 12	$\frac{1}{2}$ of 7	$\frac{1}{2}$ of 11
$\frac{1}{2}$ of 16	$\frac{1}{2}$ of 9	$\frac{1}{2}$ of 13
$\frac{1}{2}$ of 10	$\frac{1}{2}$ of 5	$\frac{1}{2}$ of 17
$\frac{1}{2}$ of 20	$\frac{1}{2}$ of 3	$\frac{1}{2}$ of 19

CHAPTER IV.

LESSON LV.

TENS.

Can you count twenty by the Roman numbers ?

I.	VI.	XI.	XVI.
II.	VII.	XII.	XVII.
III.	VIII.	XIII.	XVIII.
IV.	IX.	XIV.	XIX.
V.	X.	XV·	XX.

COPY NEATLY:

Ten	10	X.
Twenty	20	XX.
Thirty	30	XXX.
Forty	40	XL.
Fifty	50	L.

COMPLETE :

$10+10=$	$90 \div 10 =$	$3 \times 10 =$
$20+10=$	$30 \div 10 =$	$5 \times 10 =$
$30+10=$	$40 \div 10 =$	$50-10=$
$40+10=$	$50 \div 10 =$	$40-10=$

ANSWER IN WRITTEN EQUATIONS:

1. Two bags with ten marbles in each contain how many marbles ?
2. Twenty sticks will make how many bundles of ten?
3. Three rows of single desks, 10 in a row, will seat how many pupils?
4. From a shelf containing 50 books, 10 were taken. How many were left ?
5. How many fingers do 4 girls have ?

WRITE A PROBLEM FOR EACH OF THESE:

$20+10=$?	$40-10=$?
$\frac{1}{3}$ of $30=$?	$50-10=$?

LESSON LVI.

COMPLETE:

$\frac{1}{2}$ of 20=	$3\times10+2=$	10= of 20
$\frac{1}{3}$ of 30=	$4\times10+8=$	10= of 30
$\frac{1}{4}$ of 40=	$3\times10+7=$	10= of 40
$2\times10+5=$	$5\times10=$	10= of 50

COPY NEATLY:

Sixty	60	LX.
Seventy	70	LXX.
Eighty	80	LXXX.
Ninety	90	XC.
One hundred	100	C.

COMPLETE:

$50+10=$	$80+10=$	$80\div10=$
$6\times10=$	$8\times10=$	$70\div10=$
$60+10=$	$90+10=$	$90\div10=$
$7\times10=$	$10\times10=$	$100\div10=$

ANSWER IN WRITTEN EQUATIONS:

1. How many tulips will plant 6 circles if 10 are planted in each?

2. If 60 words are in 6 columns of equal length, how many in each column?

3. I have 80 pears to put into baskets, each of which will hold 10; how many baskets do I need?

4. Lucy had 10 coops with 10 chickens in each coop, but this morning she sold 50 chickens. How many has she now?

5. Miss Cook has in her school-room 7 rows of single desks, 10 in each row, and these are just enough for her pupils, but to-day 20 pupils are absent. How many are present?

WRITE PROBLEMS FOR THESE:

$$80\div10= \quad ? \qquad 6\times10-20= \quad ?$$

LESSON LVII.

SIGHT WORK.

ADD:

20	40	70	10	10	20	20	20	20
10	10	10	80	90	20	30	40	60

SUBTRACT:

60	70	80	80	50	60	40	30	70
10	10	10	20	20	20	20	20	20

MULTIPLY: DIVIDE:

10	10	10	10
3	7	8	6

$10\overline{)40}$ $10\overline{)50}$ $10\overline{)80}$ $10\overline{)100}$

ANSWER IN WRITTEN EQUATIONS:

1. When pineapples are 10 cents apiece, how many will 60 cents buy?

2. Rufus had 70 walnuts and gave Nellie 40 of them, how many did he have then?

3. Charlie got 80 chestnuts and gave Rachel and Laura 20 apiece. How many did he have left?

4. Four little boys shared equally a bag of 80 walnuts. How many was that for each?

Write a problem for $3 \times 10 + 5 = $?

Write one for $6 \times 10 - 50 = $?

LESSON LVIII.

ANSWER IN WRITTEN EQUATIONS:

1. Three dimes, a nickel, and five 1-cent pieces are how many cents?

2. Three nickels and a dime are how many cents?

3. Twenty-five marbles in one box and 15 in another are how many marbles?

4. Ralph had 50 cents; he bought two tops at 10 cents apiece and 4 street car tickets at 5 cents apiece. What did he have then?

5. Six little girls hold up all their fingers, and Alice holds up those on her right hand. How many?

6. Five squads of boys are drilling, 10 in a squad, and a captain for each squad. How many boys?

7. Three hens had each 20 chickens, but the hawk caught five. How many were left?

8. Willie had 100 chestnuts and gave Mabel 20 and Ruth 30. How many did he have then?

Write problems for these:

$$100 - 2 \times 40 = \ ? \qquad 60 - 2 \times 20 = \ ?$$

LESSON LIX.

THE NUMBER TWENTY-ONE.

COPY AND COMPLETE:

$10+10+1=$	$2 \times 9 + ? = 21$	$21 \div 3 =$
$XXI -=$	$3 \times 6 + ? = 21$	$\frac{1}{3}$ of $21 =$
$7+7+7=$	$4 \times 5 + ? = 21$	$\frac{2}{3}$ of $21 =$
$21 \div 7 =$	$4 \times 4 + ? = 21$	$\frac{1}{7}$ of $21 =$

ONE YARD

1 Ft.   1 Ft.   1 Ft.
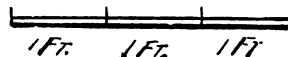
COPY AND COMPLETE:

1 yard = 3 feet.	$\frac{1}{3}$ yard =
3 yards = ? feet.	$\frac{2}{3}$ yard =
12 feet = ? yards.	13 feet — 2 yards =
15 feet = ? yards.	17 feet — 3 yards =
6 yards = ? feet.	16 feet — 4 yards =
7 yards = ? feet.	20 feet — 6 yards =

ADD:

Yd.	Ft.	Yd.	Ft.	Yd.	Ft.	Yd.	Ft.
6	1	9	2	17	2	6	2
7	2	8	1	9	2	10	2

LESSON LX.

Write the equal numbers in 22.

Write the unequal numbers in 22.

What is one-half of 22 ?   One-half of 23 ?

GIVE THE ANSWERS IN EQUATIONS:

1. How much money will buy 3 one-cent stamps and 10 two-cent stamps?

2. I gave Maud and Ida 8 figs apiece and kept 6. How many did I have at first?

3. There are 3 rows of desks in our room with 6 in each row, and another row of 5 desks. How many in all?

4. Maggie carried 23 cents to the store. She bought an apple for 8 cents, and spent the rest of her money in oranges at 5 cents apiece. How many oranges did she buy?

5. How many separate triangles and what part of another can be laid with 23 sticks?

6. How many separate squares and what part of another can be laid with 23 sticks of the same length?

Write problem for $23 - 2 \times 5 = ?$

COMPLETE:

$$22 = 2 \times 9 + ?$$
$$2 \times 8 + ? = 22$$
$$3 \times 7 + ? = 22$$
$$22 - 2 \times 8 =$$
$$23 - 2 \times 9 =$$

$$3 \times 6 + ? = 22$$
$$23 - 2 \times 7 =$$
$$5\tfrac{1}{2} \times 4 =$$
$$22 \text{ pt.} = \quad \text{qt.}$$
$$1 \text{ yr.} + ? = 22 \text{ months.}$$

LESSON LXI.
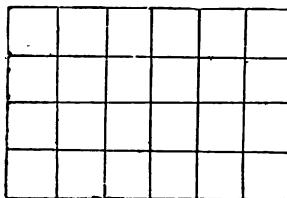
We will let this picture represent a rectangle four inches wide and six inches long.

How many square inches in one horizontal row of squares?

One horizontal row of squares is what part of the rectangle?

Two horizontal rows are what part of the rectangle?

How many vertical rows of squares?

How many square inches in three vertical rows?

What is one-fourth of 24?

What is one-sixth of 24?

What is five-sixths of 24?

COMPLETE:

½ of 24=	24÷12=	12= of 24
¼ of 24=	24÷6 =	6= of 24
¾ of 24=	24÷4 =	18= of 24
¾ of 24=	24—6 =	4= of 24
⅙ of 24=	24—12=	8= of 24
⅜ of 24=	24—18=	16= of 24
⅚ of 24=	24—16=	20= of 24

LESSON LXII.
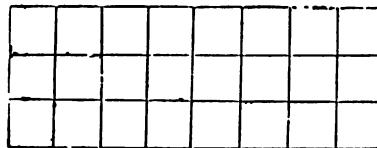
Let this picture represent a rectangle 3 inches wide and 8 inches long.

Eight square inches are what part of the rectangle?

Two-thirds of the rectangle are how many square inches?

How many rectangles 1 inch by 3 inches do you see in the large rectangle?

Three square inches are what part of the rectangle?

Six square inches are how many eighths of it?

Nine square inches are how many eighths of it?

Twelve square inches are how many eighths of it?

How many of the inch squares have 2 sides in the boundary of the rectangle? How many have 1 side? How many have no side in the boundary?

COPY AND COMPLETE.

$\frac{1}{8}$ of 24=	8= of 24	24÷3=
$\frac{2}{3}$ of 24=	16= of 24	24÷8=
$\frac{1}{8}$ of 24=	3= of 24	19+5=
$\frac{2}{8}$ of 24=	9= of 24	24—9=
$\frac{3}{8}$ of 24=	$\frac{1}{8}$ of 24=$\frac{1}{3}$ of 24	24—7=
$\frac{4}{8}$ of 24=	$\frac{2}{8}$ of 24=$\frac{1}{4}$ of 24	24—13=
		24—10=

LESSON LXIII.

ANSWER IN WRITTEN EQUATIONS:

1. If 6 cups are a set, how many sets in 2 dozen cups?

2. Robert sold 24 white rabbits in boxes that held 2 pairs each. How many boxes were there?

3. If 8 yards of wire are cut into pieces 1 foot in length, how many pieces will there be?

4. Katie had 2 dozen pansies and gave Ellen one-third of them. How many did Katie have then?

5. Willie had 24 bird eggs and sold one-fourth of them to James at 3 cents apiece. What did he get for them?

6. Two dozen eggs at 12 cents a dozen will buy how much sugar at 8 cents a pound?

7. Janet goes to school two-thirds of the year. In 8 years that will be how many months in school?

8. When butter is 24 cents a pound, what will three-fourths of a pound cost?

9. Ralph is 2 years old and the baby is 3 months old. What is the difference in their ages?

10. How many more sides do 4 hexagons have than 3 triangles?

Write a problem for $24 \div 3 = $?

LESSON LXIV.

SIGHT-WORK.

GIVE THE RESULT:

7+2	7+3	5+3	6+3	6+4	5+5
17+2	17+3	15+3	16+3	16+4	15+5
27+2	27+3	25+3	26+3	26+4	25+5
37+2	37+3	35+3	36+3	36+4	35+5
47+2	47+3	45+3	46+3	46+4	45+5

COPY AND COMPLETE:

8 pints=1 gallon.	2 yr.—9 mo.= mo.
24 pt.= gal.	18 mo.+ =2 yr.
6 yd.= ft.	2 ft.—7 in.=
21 ft. = yd.	2 ft.—17 in.=
24 ft. = yd.	24 cents—1 dime=
3 wk.+ =24 da.	20 qt.= gal.
24 da.—2 wk.=	19+ =24.
20+½ of 20=	23—16=
¾ of 24=	22—13=

LESSON LXV.

SIGHT WORK.

COMPLETE THESE PROBLEMS:

16—¼ of 16=?   A man bought 16 watermelons and sold ¼ of them.   How many were left?

20+⅕ of 20=?   Ralph bought a bicycle for 20 dollars and sold it for ⅕ more than it cost.   What did he get for it?

WRITE PROBLEMS FOR THESE:

| 24—¼ of 24=? | 15+2×4=? |
| 20+⅕ of 20=? | 20—2×6=? |

GIVE THE RESULT:

9+4	34+9	8+2	32+8	72+8
19+4	44+9	18+2	42+8	82+8
29+4	54+9	28+2	52+8	92+8

6×3	4×6	2×12	15÷3	20÷5
8×2	2×9	8×3	21÷7	18÷6
5×4	3×8	3×7	24÷8	21÷3

| ⅓ of 12 | ⅕ of 15 | ¼ of 16 | ¼ of 20 | ¼ of 24 |
| ⅔ of 12 | ⅖ of 15 | ¾ of 16 | ¾ of 20 | ¾ of 24 |

Study these columns till you can add them rapidly:

6	3	4	5	5	6	2	4	3
2	5	2	2	4	3	6	6	3
3	1	3	2	3	3	1	3	3
2	2	4	4	2	2	3	3	3
5	2	2	6	5	3	2	5	3
3	6	9	6	8	9	6	9	3
—	—	—	—	—	—	—	—	—

LESSON LXVI.
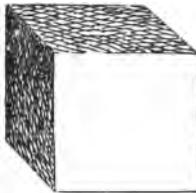
THE CUBE.

ANSWER IN COMPLETE SENTENCES:

1. The cube has how many surfaces?
2. How many edges does the upper base have?
3. How many edges does the lower base have?
4. As it lies on the desk how many edges are vertical?
5. How many edges are horizontal?
6. The cube has how many edges?
7. How many points has it?
8. How many edges meet in each point?
9. How large is each surface of a cubic inch?
10. If you paste colored paper on each face of an inch cube how long a piece of paper will it take to cover it, if the paper is an inch wide?

Write anything else you know about the cube.

What things have you seen that are like a cube in form?

LESSON LXVII.

Write the name of everything you can think of that is in form like a sphere.

COPY NEATLY AND COMPLETE.

The Sphere and the Cube.

I. Likenesses.

1. Both are solids,

(Can you think of other likenesses?)

II. Differences.

1. The sphere has one —— surface. The cube has —— —— surfaces.

2. The sphere has —— corners. The cube has —— corners.

3. The sphere has —— edges. The cube has — edges.

4. The sphere will —— and ——. The cube will—— but it will not——

(Can you think of other differences?)

CHAPTER V.

NUMBERS FROM TWENTY-FIVE TO THIRTY.

LESSON LXVIII.

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o o o o o
o o o o o
o o o o o
o o o o o
o o o o o
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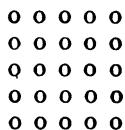
Look at the picture as you copy and complete the following:

$5\times5=$	$\frac{3}{5}$ of $25=$	$25\div10=$	$13+12=$
$25\div5=$	$\frac{4}{5}$ of $25=$	XXV.$=$	$25-16=$
$\frac{1}{5}$ of $25=$	$10+10=$	$25-15=$	$3\times8+$?$=25$
$\frac{2}{5}$ of $25=$	$2\frac{1}{2}\times10=$	$12+12=$	$25\div8=$

ANSWER IN WRITTEN EQUATIONS:

1. What will 5 oranges cost at 5 cents apiece ?

2. Lucia had a quarter of a dollar and bought 3 yards of ribbon at 6 cents a yard. What change did she receive ?

3. If twenty-five blocks are laid in rows of five, how many will be in each row ?

4. How many sticks will lay a pentagon ?

5. Two dozen sticks lack what of being enough to lay 5 pentagons ?

6. Mattie is 2 years and one month old; the baby is 3 months old. How much older is Mattie ?

7. Ralph had 25 roses and sold $\frac{3}{5}$ of them. How many did he have then ?

8. Mrs. Gray had 25 lambs and sold $\frac{1}{5}$ of them for 2 dollars apiece; how much did she get for them ?

Write a problem for $25\div5=$?

Write one for $25-2\times9=$?

LESSON LXIX.

Study till you can answer rapidly.

2×7= ?	What is	What is
3×7= ?	⅓ of 15	20÷5
2×8= ?	⅔ of 15	24÷8
2×9= ?	¼ of 16	21÷7
3×8= ?	⅜ of 16	25—9
2×12= ?	⅓ of 24	16+8
2×11= ?	⅔ of 24	17+8
6×4= ?	⅘ of 25	13+12

ANSWER IN WRITTEN EQUATIONS.

1. John and Willie have 10 melons apiece and Dora and Harriet have 3 apiece. How many melons do they all have ?

2. Maggie and Lee went to the shop to buy a dozen little cakes apiece but the baker gave each child one more than that. How many cakes was that for both?

3. There are 26 girls in Miss Watson's class and they march in couples. How many couples ?

4. What will be the price of a 6 cent sponge and 2 copy-books at 10 cents apiece ?

5. Twenty-six sticks all of the same length will lay how many squares and what part of another ?

Write a story for ½ of 26=?

COPY AND COMPLETE :

XXVI.=	26 in.—2 ft.	26 da.—3 wk.=
26÷13=	8 yd.= ? ft.	4×6+⅓ of 6=
½ of 26=	26 ft.—8 yd.	26÷6=
26—16=	26 ft.= ? yd.	26—5×5=

LESSON LXX.
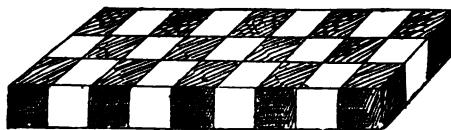
These blocks are inch cubes.
How many blocks do you see ?
One long row of blocks is what part of all ?
Two long rows are how many blocks ?
How many short rows of blocks are there ?
One-ninth of 27 is what ?
Four short rows are how many blocks ?
What number is $\frac{2}{3}$ of 27 ?
Play that these blocks are one large block.   How many square inches on its upper surface ?

How many square inches on the vertical surface in front?

How many square inches on the vertical surface at the end ?

If these blocks were put into a pile three inches wide and three long, how high would it be ?

If the bottom layer of blocks is red, the middle white, and the top blue, how many of each color ?

If the blue blocks are taken away, how many blocks are left ?

Write a story for $27 \div 3 = ?$

COPY AND COMPLETE :

$27 = 20 +$	$\frac{2}{3}$ of $27 =$	$27 \div 6 = ?$
$XXVII =$	$27 = 3 \times 8 +$	$5 \times 5 + ? = 27$
$18 + ? = 20$	$27 \div 8 =$	$27 \div 5 =$
$18 + ? = 27$	$3 \times 7 + ? = 27$	$27 = 6 \times 4 +$
$27 = ? \times 9$	$27 \div 7 =$	$27 \div 4 =$
$\frac{1}{3}$ of $27 =$	$4 \times 6 + ? = 27$	27 ft.$=$ yd.

LESSON LXXI.

COPY NEATLY AND ADD:

gal.	qt.	gal.	qt.	gal.	qt.	gal.	qt.
6	1	2	1	9	3	8	2
3	1	8	2	5	1	4	2
4	1	7	2	6	2	7	1

ANSWER IN WRITTEN EQUATIONS.

1. How many leaflets on 9 clover stems?

2. The trillium, or wake-robin, has 3 petals. How many petals would 6 such blossoms have?

3. Draw 4 pansies. How many petals have they?

4. One dozen blocks will make how many groups of 3? Two dozen will make how many groups of 3?

5. Twenty-seven cents will buy how many yards of ribbon at 9 cents per yard?

6. How many pieces will there be if 4 oranges are divided like this?
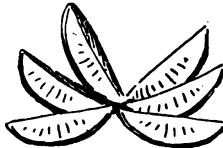
Make a problem for $3 \times 6 = ?$

Make one for $20 \div 4 = ?$

LESSON LXXII.

ANSWER IN WRITTEN EQUATIONS.

1. There were 4 single sticks and one bundle of 10 in the box and Miss Bernard asked Hugh to put that many more with them. How many sticks were then in the box?

2. Two dozen oranges and a third of a dozen are how many?

3. Two dimes, three one-cent pieces, and what other coin will make 28 cents?

4. What Roman letters stand for 28?

5. Nora staid 14 days with her cousin and 2 weeks with her aunt. How many days was she away from home?

6. Twenty-eight door knobs are enough for how many doors that have a knob inside and one outside?

7. How many pentagons and what part of another can be laid with 28 sticks?

8. How many more sides do 7 squares have than 8 triangles?

9. Seven pies were cut into quarters and 21 pieces eaten; how many pieces were left?

10. Edith and Helen are seven years old today. Grandpa gave Edith 7 dollars in quarters, and Helen the same amount in half-dollars. How many more coins does Edith have than Helen?

COPY AND COMPLETE THIS PROBLEM:

$28 \div 7 = ?$ Lucia sewed 28 buttons on her brother's jackets, putting 7 on every jacket. How many jackets were there.

Write a problem for $28 \div 14 = ?$

Write one for $28 - 3 \times 5 = ?$

LESSON LXXIII.

Write the equal numbers in 20, 21, 22, 23, 24, 25, 26, 27, 28. Which of these numbers can be divided equally by 4? Which by 8?

COPY AND COMPLETE:

$$2 \text{ weeks} = \quad \text{days}. \qquad 28 = 3 \times 9 + ?$$
$$21 \text{ wk.} = \quad \text{da}. \qquad 3 \times 8 + \tfrac{1}{2} \text{ of } 8 =$$
$$28 \text{ wk.} = \quad \text{da}. \qquad 28 \div 8 =$$
$$2\tfrac{1}{3} \text{ ft.} = \quad \text{in}. \qquad 28 \text{ qt.} = \quad \text{gal}.$$
$$2\tfrac{1}{3} \text{ yr.} = \quad \text{mo}. \qquad \tfrac{3}{4} \text{ of } 28 =$$
$$28 \text{ pt.} = \quad \text{qt}. \qquad 9 \text{ yds.} + 1 \text{ ft.} = \quad \text{ft}.$$

$$20 + 4 + 5 = \qquad 29 \div 5 = \qquad 18 + ? = 20$$
$$\text{XXIX} = \qquad 29 = 2 \times 13 + ? \qquad 18 + ? = 25$$
$$18 + \ ? = 20 \qquad 7 \times 4 + \tfrac{1}{4} \text{ of } 4 = \qquad 16 + ? = 20$$
$$18 + \ ? = 29 \qquad 29 \div 4 = \qquad 16 + ? = 27$$
$$3 \times 9 + ? = 29 \qquad 29 \text{ qt.} - 6 \text{ gal.} = \qquad 17 + ? = 20$$
$$29 - 3 \times 8 = \qquad 29 \text{ mo.} - 2 \text{ yr.} = \qquad 17 + ? = 24$$
$$29 = 4 \times 6 + ? \qquad 2 \text{ ft.} + ? = 29 \text{ in.} \qquad 24 - 7 = ?$$

COPY NEATLY AND ADD:

Wk.	Da.		Wk.	Da.		Wk.	Da.		Wk.	Da.
6	2		4	5		6	2		3	2
4	1		3	2		8	4		7	4
3	3		6	1		4	3		6	4
—	—		—	—		—	—		—	—

LXXIV.
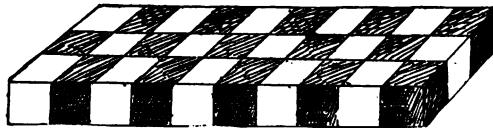
Lewis has a box of blocks of which half are white and half red, and all are inch cubes. Suppose he arranges them as they are in the picture. We will call the solid they form a *prism*.

1. How many surfaces has this prism? How many edges? How many points? How many inches long, wide and high, is it?

2. Which surfaces are 3 inches wide and 10 inches long? How many surfaces are 1 inch by 3 inches? How many surfaces are 1 inch by 10 inches?

3. How many edges are 3 inches long? How many are only 1 inch long? How many are 10 inches long?

4. If I take away one long row of blocks, what part of the prism will be left? How many blocks will be left? Ten is what part of 30? Twenty is what part of 30?

5. If I take away one long row of blocks and half the next row, how many will be left?

6. If Lewis should make these blocks into a prism just twice as high as this, how long would it be? Draw it.

COPY AND COMPLETE.

30÷10=	80÷ 5=	10=ᵣ of 80	80 feet=? yards.
30÷15=	80÷ 3=	20=ᵣ of 80	2½ feet=? inches.
30÷20=	30÷ 2=	30—7×4=	30 inches—?=2 ft.
80÷ 6=	½ of 30=	80—5×5=	30 pints=? qts.

LESSON LXXV.

RAPID SIGHT-WORK.

ADD.

5	3	2	3	5	1	9	4	6	8
2	3	5	2	4	1	8	6	3	4
8	4	5	8	6	9	2	4	7	4

2	5	4	6	8	6	7	2	3	4
6	7	5	2	3	4	9	6	4	3
5	4	6	9	8	7	2	6	8	9

MULTIPLY:

6	6	6	5	5	4	8	8	9	10	12
3	4	5	5	6	7	7	3	3	3	2

DIVIDE.

8 | 24 7 | 28 10 | 30 12 | 24 16 | 30 13 | 26 4 | 28 15 | 30

Copy these problems and complete them:

⅔ of 18=? Joseph had 18 rabbits and put them into three pens with the same number in each. How many rabbits were in 2 of the pens? — rabbits. ⅔ of 18=

¼ of 20=? If 4 pears sell for 20 cents, what is that for 1 pear? — cents. ¼ of 20=—.

¾ of 20=? If four pears sell for 20 cents, what is that for 3 pears? — cents. ¾ of 20=

⅕ of (17+8)=? Mary picked 17 roses from one flower-bed and 8 roses from another. She put them into five vases with the same number in each. How many roses in each vase? — roses. ⅕ of (17+8)=

Now write a problem yourself for each of these equations.

⅓ of 21=?
¼ of (13+7)=?

LESSON LXXVI.

COPY AND COMPLETE:
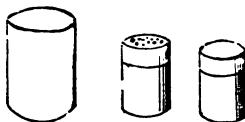
THE CYLINDER.

The cylinder is a solid. It has —— edges. It has ——
curved surface and —— plane surfaces. The plane surfaces
are ——.

Now write the names of things that are like a cylinder.

COPY AND COMPLETE:

THE CYLINDER AND THE CUBE.

I. LIKENESSES.

1. Both are ——.
2. Each has ——.
3. Each has ——.

II. DIFFERENCES.

1. The cube has —— corners. The cylinder has ——
corners.

2. The cube has —— edges. The cylinder has ——
edges.

3. The cube has —— —— surfaces. The cylinder has
——.

4. The cube will ——. The cylinder will —— and ——.

CHAPTER VI.

NUMBERS FROM THIRTY-ONE TO THIRTY-FIVE.

LESSON LXXVII.

REVIEW.

GIVE RESULT:

$16 \div 4$	$20 \div 10$	$24 \div 8$
$16 \div 8$	$20 \div 5$	$24 \div 6$
$18 \div 2$	$20 \div 4$	$27 \div 9$
$18 \div 6$	$20 \div 2$	$28 \div 7$
$18 \div 9$	$21 \div 7$	$24 \div 2$
$18 \div 3$	$21 \div 3$	$30 \div 15$
$15 \div 5$	$22 \div 11$	$30 \div 6$
$15 \div 3$	$22 \div 2$	$30 \div 8$

COPY AND COMPLETE.

$XXXI =$	$15\frac{1}{2} \times 2 =$	$31 \div 6 =$
$15 + 16 =$	$31 - 20 =$	$31 - 6 \times 5 =$
$30 \div 2 =$	$31 - 4 \times 7 =$	$31 \div 5 =$
$31 \div 2 =$	$31 - 5 \times 6 =$	$31 \div 4 =$

ANSWER IN WRITTEN EQUATIONS:

1. How many schooldays in 5 weeks ?
2. How many work days in five weeks?
3. Seven triangles have how many angles?
4. Five hexagons have how many sides ?
5. How many angles do 6 squares have ?
6. How many sides do 5 pentagons have ?
7. How many triangles and what part of another can be laid with 31 sticks?
8. How many squares and what part of another can be laid with 31 sticks of the same length ?

Write a problem for each of these equations.

$$31 - 5 \times 5 = \ ? \qquad 4 \times 7 + 3 = \ ?$$

LESSON LXXVIII.

COPY AND COMPLETE.

1 bushel=4 pecks.	2 bushels=
½ bushel=	2½ bushels=
¼ bushel=	16 pecks=
¾ bushel=	18 pecks=
½ bushel+¼ bushel=	24 pecks=

1. When lime sells for 20 cents a bushel, what should be the price of a peck?

2. Walter bought a bushel of tomatoes for 50 cents and sold them for 20 cents a peck. What did he gain?

8. If from 3 bushels of potatoes 7 pecks are taken, how many pecks will be left?

4. There are three boxes in the pantry with 1½ bushels of apples in each; how many pecks of apples in all?

5. How many boxes will it take for 13 bushels of potatoes, if a half bushel is put into each?

GIVE PROBLEMS FOR THESE EQUATIONS:

2 bushels—3 pecks=?   3×3 pecks=? bushels.

LESSON LXXXVI.

ADD:

Bu.	Pk.	Bu.	Pk.	Bu.	Pk.	Bu.	Pk.
7	2	7	1	10	1	3	3
5	1	3	2	10	2	6	1
8	1	4	1	10	2	9	2

1. There are 5 bushels of corn in a barrel. Ralph got 16 bushels from one patch and 9 bushels from another; how many barrels will that fill?

2. Write a problem for (16+5)÷3= ?

3. Ben gathered 3 pecks of popcorn from each of 3 rows and put it into a box that would hold 2½ bushels. What did the box lack of being full?

3. Write a problem for 18+ ?=25.

4. If George gathers 3½ bushels of tomatoes, to how many of his customers can he sell a peck each?

5. He sends potatoes to town in boxes that hold a half-bushel each. How many boxes will it take for 9½ bushels of potatoes?

6. Write a problem for 16 bushels—(3½ bu.+1½ bu.)=?

LESSON LXXIX.
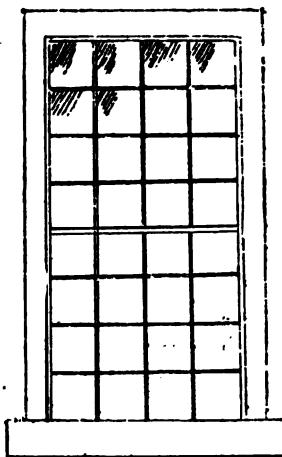
How does the height of this window compare with its width ?

How many panes in each sash ?   How many in both ?

How many vertical rows of panes ?

Two vertical rows contain how many panes ?

Four horizontal rows contain how many panes ?

When one blind is closed, what part of the window is covered ?   how many panes ?

When 3 blinds are closed how many panes are covered ?

How many squares of 2 panes each way do you see in the upper sash ?   In both sashes ?

How many squares of 3 panes each way, and how many panes besides are in the upper sash ?

How many more panes in this window than in one that has only 12 panes in each of its 2 sashes ?

Draw an oblong rectangle and lay it off into 32 squares.

LESSON LXXX.

COPY AND COMPLETE:

$32 \div 16 =$ $\frac{1}{2}$ of 32 $\frac{1}{2}$ of $32 = \frac{1}{4}$ of 32
$32 \div 8 =$ $\frac{1}{4}$ of 32 $\frac{3}{4}$ of $32 =$
$32 \div 4 =$ $\frac{1}{8}$ of 32 $\frac{3}{8}$ of $32 =$

$3 \times 10 + ? = 32$ $2 \times 13 =$
$32 - 3 \times 9 =$ $2 \times 14 =$
$32 - 4 \times 7 =$ $2 \times 15 =$
$32 - 5 \times 6 =$ $2 \times 16 =$
$32 \div 6 =$ 32 pk. $=$? bu.
$6 \times 5 + ? = 32$ 32 in.—2 ft. $=$
$32 \div 5 =$ 32 days—4 wks. $=$

Count by 2's to 32; by 4's; by 8's; by 16's.

COPY AND COMPLETE THIS PROBLEM:

32c.—$(3 \times 5c. + 7c.) = ?$ Frank had 32c. He bought 3 marbles at 5c. apiece and a top cord at 7c. How much money did he have then ? —— cents.

Write a problem for 25c.—$(2 \times 7c. + 6c.) = ?$

LESSON LXXXI.

REVIEW QUESTIONS.

1. Eight quarts will fill a peck measure. How many quarts in a half-bushel ?

2. How many quarts in $\frac{3}{4}$ of a bushel ?

3. A bushel of meal contains how many quarts ?

4. Rufus carried 3 dimes to the store and bought 4 pounds of sugar at 7c. a pound. What change did he receive ?

5. Vinegar is 8 cents a quart; Joseph carried 20c. to the store for a half-gallon. What change did he receive ?

6. Toy flags are 2 cents apiece and tin soldiers 20 cents a dozen. Rob buys a half-dozen of each; what must he pay for them ?

7. When lime is 32 cents a bushel, what should 3 pecks cost ?

8. Some little girls bought 8 yards of rope and had it cut into jumping-ropes. If each rope is 6 feet long, how many do they have ?

9. Robert gathered 17 bushels of pecans from his trees. He sold $3\frac{1}{2}$ bushels to one man and $6\frac{1}{2}$ bushels to another. How many bushels did he have then ?

10. Walter has 20 sheep, and James $\frac{4}{5}$ of that number. How many sheep do both of them have ?

LESSON LXXXII.
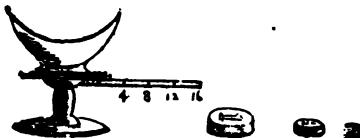
COPY AND COMPLETE:

One Pound (lb.)=16 Ounces (oz.)

$\frac{1}{2}$ lb.= oz.	$1\frac{1}{2}$ lb.—12 oz.=
$\frac{1}{4}$ lb.=	1 lb.+8 oz.= oz.
$\frac{1}{2}$ lb.+$\frac{1}{4}$ lb.=	1 lb.+12 oz.=
$\frac{1}{8}$ lb.==	2 lb.—$\frac{1}{2}$ lb.= oz,
$\frac{1}{8}$ lb.+$\frac{1}{2}$ lb.=	2 lb.—$\frac{1}{4}$ lb.=
$\frac{1}{4}$ lb.+$\frac{1}{8}$ lb.=	14 oz.+18 oz.= lb.
1 lb.—4 oz.=	2 lb.÷8 oz.=
$1\frac{1}{2}$ lb.+8 oz.=	2 lb.÷$\frac{1}{4}$ lb.=
$1\frac{1}{4}$ lb.—$\frac{1}{4}$ lb.=	$\frac{3}{4}$ lb.+? =32 oz.

1. Steak is 12 cents. a pound, what will a pound and a quarter cost me ?

2. My recipe calls for 2 lbs. of sugar, but the scale pan balances only 1lb. 12 oz.; how much more sugar must be put into the pan?

3. What will $2\frac{1}{2}$ pounds of currants cost at 20c. a pound ?

4. $1\frac{1}{2}$ lbs. of butter will make how many cakes that weigh $\frac{3}{4}$ of a pound each? 3 lbs. will make how many such cakes?

5. What will a quarter of a pound of cinnamon cost at 8 cts. an ounce ?

6. What will $1\frac{3}{4}$ lbs. of soap cost at 12 cents a pound ?

LESSON LXXXIII.

DRILL ON COMBINATIONS ENDING IN TWO.

1. What number added to each will make 12?

6	8	9	8	4	7	5	1	8	2	10	11
—	—	—	—	—	—	—	—	—	—	—	—

2. What added to each will make 22?

16	13	19	18	14	17	15	11	13	12	20	1
—	—	—	—	—	—	—	—	—	—	—	—

3. What added to each will make 32?

26	23	29	28	24	27	25	21	16	17	18	19
—	—	—	—	—	—	—	—	—	—	—	—

STUDY TILL YOU CAN ADD RAPIDLY:

A	B	C	D	E	F	G	H
5	4	7	5	5	8	6	4
4	8	3	3	5	2	5	5
2	3	4	5	2	5	2	5
3	2	2	3	4	4	3	4
4	3	8	4	4	4	4	2
2	5	4	3	3	2	6	4
9	5	6	6	2	8	4	3
8	2	2	6	3	3	2	9
—	—	—	—	—	—	—	—

LESSON LXXXIV.

ANSWER IN WRITTEN EQUATIONS:

1. Three bundles of 10 sticks, and 3 single sticks are in the numeration box; how many is that?

2. There are 20 ducks, 10 guineas, and 3 geese in the yard; how many fowls in all?

3. There are 4 rows of single desks in our school-room; 3 of the rows have 9 desks each, the other row only 6; how many pupils can be seated in the room?

4. Walter had 33 cents and bought 8 oranges at 4 cents apiece; how much had he then?

5. In the closet are 5 sets of plates, 6 in a set, and 3 odd plates; how many in all?

6. Katie has 33 cents in her bank. One of the coins is a 2-cent piece, one a cent, and the rest are nickels. How many nickels?

7. There are 8 rooms in my house, 4 windows in each room, and 1 window in the hall; 20 windows have shades or curtains; how many have not?

8. How many figs at 3 cents apiece will 33 cents buy?

9. John and little Fritz are earning money for mother's birthday present. John gets a dime and Fritz 3 cents every day; 3 days' work will give them how much money?

10. What will 32 plums cost at half a cent apiece?

COMPLETE:

$$33 = 20 + \qquad 2 \times 16 = \qquad 16 + \quad = 33$$
$$XXXIII = \qquad 16\tfrac{1}{2} \times 2 = \qquad 11 = \ \text{of } 33$$
$$33 \div 11 = \qquad 33 \text{ mo.} = ? \text{ yr.} \quad \tfrac{2}{3} \text{ of } 33 =$$

WRITE PROBLEMS FOR:

$$33 - 4 \times 7 = ? \qquad 5 \times 6 + \ ? = 33$$

LESSON LXXXV.

What number added to each will make 13 ?

10	7	9	4	8	3	5	2	6	11	1

2. What added to each will make 23 ?

18	19	16	17	14	12	15	13	11	10	9	6	7

3. What added to each will make 33 ?

10	20	22	24	26	28	21	23	25	27	29	19

DRILL ON COMBINATIONS ENDING IN THREE.

STUDY TILL YOU CAN ADD RAPIDLY :

A	B	C	D	E	F	G	H
6	2	4	3	2	5	2	4
5	6	2	2	6	3	6	7
2	2	4	4	3	1	6	4
5	4	5	2	4	2	3	5
3	4	2	4	4	6	4	4
2	2	3	4	2	3	5	4
3	6	5	9	7	4	4	2
5	7	8	4	6	9	4	3

LESSON LXXXVI.

COPY AND COMPLETE THESE PROBLEMS :

$\frac{1}{3}$ of (22—4)=? Florence had 22 tulip bulbs. She sent 4 to a little friend, and planted the rest in 3 rows of the same length. How many tulips in each row ?

25—(6+7+2)=? There were 25 flowers on Miss Russell's desk. She gave 6 lilies to Frank, 7 tulips to Mary, and 2 roses to Alice· How many flowers did she then have ?

$\frac{3}{5}$ of 20=? If 20 apples are distributed equally among 5 little girls, 3 of the girls will have how many of the apples ?

WRITE PROBLEMS FOR :

$$\frac{1}{4} \text{ of } (29—5)=?$$
$$30—(8+4+3)=?$$
$$\frac{2}{5} \text{ of } 25=?$$

LESSON LXXXVII.

Draw a rectangle 7 inches by 5 inches, on a scale of $\frac{1}{4}$ of an inch for an inch.   Lay it off in square inches.   How many square inches?

Write a problem for each of these:

$$35—5 \times 5 = ?$$
$$35 \div 7 = \ ?$$
$$\tfrac{1}{5} \text{ of } 35 = \ ?$$

Make a picture showing $\frac{3}{5}$ of 35.

COMPLETE :

XXXV=	35—2×14=
3½×10=	7=ᵪ of 35
35÷10=	$\frac{3}{5}$ of 35=
35=20+	21=ᵪ of 35
2×15+$\frac{2}{3}$ of 15=	35 cents= nickels.
35=2×16+	30 days+ =5 weeks.
35—2×17=	2 feet + in. = 35 in.

ANSWER IN WRITTEN EQUATIONS :

1. How many fowls are 20 ducks, 10 turkeys, and 5 geese ?

2. Joseph bought 10 cents' worth of caramels and 3 cakes of butterscotch at 5 cents a cake.   What did he spend ?

3. Fannie and Walter had each 30 cocoons.   All of Walter's hatched into moths, but only one-sixth of Fannie's; how many butterflies in all ?

4. In Miss Roper's room are 5 rows of single desks, 7 in a row, and all are occupied.   How many pupils are there present ?

5. Three rows of the desks are occupied by boys; how many girls are there ?

6. When 7 pupils are at the sand-table and 5 at the blackboard, how many are doing other things ?

7. When two-sevenths of the class are weaving mats, how many needles do they use?

LESSON LXXXVIII.

DRILL FOR COMBINATIONS ENDING IN 4.

1. What number added to each of the following will make 14?

| 9 | 6 | 5 | 8 | 3 | 7 | 10 | 4 | 2 | 11 | 12 |

2. What added to each of these will make 24?

| 19 | 16 | 15 | 18 | 13 | 17 | 20 | 14 | 12 | 11 | 22 |

3. What added to each of- these will make 34?

| 29 | 26 | 25 | 28 | 27 | 30 | 24 | 22 | 21 | 12 |

ADD:

16	12	30	20	17	18	26	19	29	39
18	22	14	14	7	6	8	5	5	5
—	—	—	—	—	—	—	—	—	—

STUDY TILL YOU CAN ADD RAPIDLY:

A	B	C	D	E	F	G	H
3	5	2	4	9	6	4	8
3	2	6	2	2	4	4	4
5	4	6	6	4	3	4	6
1	3	3	3	3	2	4	6
4	3	5	5	2	5	4	4
2	4	6	4	8	9	4	4
3	7	2	2	4	5	4	4
9	7	6	3	2	5	4	6
—	—	—	—	—	—	—	—

CHAPTER VII.

LESSON LXXXIX.

YARD STICK.

1 Ft.   2 Ft.   3 Ft.
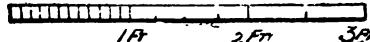
COMPLETE:

1 yard=	feet.	$\frac{1}{4}$ yard=	inches.
1 yard=	inches.	1 yard—$\frac{1}{4}$ yard=	inches.
$\frac{1}{2}$ yard=	inches.	$\frac{3}{4}$ yard=	inches.
$\frac{3}{4}$ yard=	inches.	1 yard—$\frac{3}{4}$ yard=	inches.
1 yard—1 foot=		1 yard—9 inches=	inches.
3 feet—24 inches=		36 inches—$\frac{3}{4}$ yard=	inches.
$\frac{1}{2}$ yard=		2 feet 6 inches=	inches.
1 yard—18 inches=		$\frac{1}{4}$ of 2 feet=	inches.

1. How many times must a stick 18 inches long be laid down in order to measure a yard?

2. A yard of elastic will make how many pieces each 9 inches long?

3. If 2½ yards of ribbon be cut in half, how many inches long will each piece be?

4. What will 1¼ yd. ribbon cost at 20 cents a yard?

5. How many feet and inches in the boundary of a triangle that is 11 inches on each side?

6. How many feet around a square that is 9 inches on a side?

7. How much ribbon, at 20 cents a yard, will 25 cents buy?

8. How many geraniums will border a walk if 18 are used on each side?

LESSON XC.

1. There are 36 sheep in the meadow, and 20 of them are old ones. How many lambs?

2. Three 2-cent pieces and how many dimes will make 36 cents?

3. Four rows of single desks, 9 in a row, will seat how many pupils?

4. If one-third of these pupils are girls, how many boys are there?

5. If one-fourth of the pupils are standing, how many are sitting?

6. Three dozen eggs will make how many cakes if 9 are used for each?

7. How shall I plant 36 geraniums in a square plot—how many rows and how many plants in each?

8. How many feet long is the boundary of a hexagon, every side of which is 5 inches?

9. How many dozen figs can be bought with 36 cents, if they are 2 cents apiece?

Write problems for these equations·

$$36 \div 9 = ? \qquad 36 - 4 \times 5 = ?$$

LESSON XCI.

ADD:

ft.	in.		ft.	in.		ft.	in.		ft.	in.
7	3		9	4		8	3		12	4
6	8		6	5		6	7		8	7

SUBTRACT:

ft.	in.		ft.	in.		ft.	in.		ft.	in.
13	10		15	11		14	9		16	11
7	4		3	6		5	2		9	4

1. How many inches long is the boundary of a rectangle 6 inches long and 5 wide? How many feet?

2. How long is the boundary of a square that is 8 inches on a side?

3. Tom joins 3 strips of paper. The red shows 8 inches, the white 9 inches, and the blue 1 foot. What does the piece lack of being a yard long?

4. How much must be cut from a stick measuring 40 inches to make it a yard-stick?

5. How many doll-sashes a quarter of a yard long can Julia make from 2 yards of ribbon?

6. Willie had a candy walking-stick 2 feet long. He broke off one-third of it for Jesse. How much was left?

7. Eight yards of wire will hang how many pictures, if 6 feet are used for each picture?

8. At 12 cents a foot, what will 1 yard of heavy wire cost?

9. If a piece of elastic 3 feet long be cut into 4 equal pieces, how long will each piece be?

10. How many yards around the edge of a rectangle that is 10 feet long and 8 feet wide?

Write a problem for $\frac{1}{3}$ of 36 inches=?

LESSON XCII.
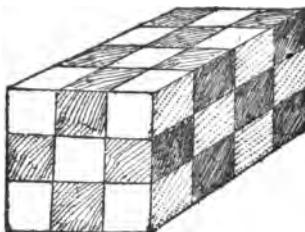
Warren builds his blocks, which are inch cubes, into this prism.

How many surfaces has this prism?

Of what shape is the front vertical face?

The top of the prism is how many inches wide and how many long?

The vertical face to the right is how wide and how long?

How many faces of the prism can you not see?

How many faces of the prism are square?

How long is each vertical edge?

How many layers of blocks in this prism?

How many blocks in each layer?

If the top layer should be taken off, how many blocks would be left?

LESSON XCIII.

What number added to each will make 15?

9   7   8   4   6   '3   5   13   10   12   11

What added to each of these will make 25?

19   17   18   14   16   10   11   12   5   13   15

STUDY TILL YOU CAN ADD RAPIDLY:

A	B	C	D	E	F.	G
2	4	2	3	6	5	5
2	4	2	3	2	4	5
6	4	2	3	2	6	5
2	3	7	3	8	2	5
3	5	3	3	3	2	5
5	6	5	3	5	6	5
7	4	3	3	3	3	5
5	3	2	3	2	3	5
3	2	5	3	4	3	5
—	—	—	—	—	—	—

LESSON XCIV.

COPY AND COMPLETE:

36=20+	36÷8=	36÷2=
36÷18=	36—5×7=	36÷9=
36—7×5=	36÷6=	½ of 36=
36÷5=	36÷12=	⅓ of 36=
36—4×8=	36÷3=	⅔ of 36=

ADD:

yr.	mo.	yr.	mo.	yr.	mo.	yr.	mo.
7	3	5	9	8	5	10	6
6	5	8	3	9	7	4	6

SUBTRACT:

yr.	mo.	yr.	mo.	yr.	mo.	yr.	mo.
7	9	13	11	16	10	17	11
2	3	2	9	9	2	9	3

ANSWER WITHOUT USING SLATE AND PENCIL:

1. Bella went to Savannah January 1, and stayed till May 1 of the next year. How many months was that?

2. School begins the first of September and closes the last of May. How long is the term?

3. Mary is 3 years old and Robert just half as old. How many months old is he?

4. How many months from June 15 to December 15?

5. How many months from January 1, 1891, to June 1, 1892?

6. Maud's birthday is the 12th of July, and Helen is 7 months younger. When is Helen's birthday?

LESSON XCV.

COPY AND COMPLETE :

The equal
numbers in
30 are:
$\begin{cases} \times 15 \\ \times 10 \\ \times\ 6 \\ \times\ 5 \\ \times\ 3 \\ \times\ 2 \end{cases}$

The equal
numbers in
36 are:
$\begin{cases} \times 18 \\ \times 12 \\ \times\ 9 \\ \times\ 6 \\ \times\ 4 \\ \times\ 2 \end{cases}$

Write the equal numbers in 32, 33, 34, 35, beginning always with the largest.

ANSWER IN WRITTEN EQUATIONS :

1. Richard went to Virginia to stay 2½ years. One year and 8 months of the time has passed. How much longer has he to stay?

2. Joseph gets 20 dollars a month and spends 14 dollars. How much will he save in 5 months?

3. Theodore gets 25 dollars a month and spends 14 dollars. In how many months will he save 33 dollars?

4. Maggie sold 30 little cakes, getting 5 cents for every half-dozen. How many half-dozen did she sell? What did she get for all of her cakes ?

5. When dried fruit is 24 cents a pound, what will 1¼ pounds cost?

6. At 32 cents a pound what will ¾ of a pound of French candy cost?

7. What will 1½ yard of lace cost at 24 cents a yard?

8. What will 2¼ pounds of prunes cost at 16 cents a pound?

Write a problem for 1½ × 20 cents = ?

LESSON XCVI.

RAPID SIGHT-WORK.

GIVE THE SUM:

7	4	4	6	5	4	5	9	9	7
6	3	8	4	3	8	7	6	8	10
5	8	9	8	9	5	6	4	3	10

GIVE THE DIFFERENCE:

12	18	22	16	18	27	32	31
7	13	17	11	9	15	20	26

MULTIPLY:

5	8	9	4	5	6	12	13	14	16	17	18
6	4	3	9	7	6	3	2	2	2	2	2

DIVIDE:

4 | 28   4 | 32   9 | 36   3 | 21   7 | 35   6 | 36   16 | 32   17 | 34

What is $\frac{1}{3}$ of each of these numbers?

  21, 27, 24, 33, 36.

What is $\frac{1}{6}$ of each of these?

 12, 24, 18, 24, 36, 30

What is $\frac{1}{7}$ of each of these?

  14, 28, 21, 35.

LESSON XCVII.

DRILL FOR COMBINATIONS ENDING IN 6.

1. What number added to each of these following will make 16?

7, 9, 4, 11, 8, 2, 6, 8, 5, 12, 13.

2. What number added to each of these will make 26?

17, 19, 14, 11, 13, 12, 16, 18, 15, 22, 3.

3. What number added to each of these will make 36?

27, 29, 24, 21, 23, 22, 26, 28, 25, 12, 13.

STUDY TILL YOU CAN ADD RAPIDLY:

A	B	C	D	E	F	G	H
2	3	4	8	8	4	6	3
4	3	4	5	3	4	6	3
4	4	2	2	4	4	6	7
2	6	4	3	7	4	6	3
2	2	8	4	3	4	6	7
4	6	2	6	5	4	6	3
4	3	6	5	2	4	6	7
2	3	4	5	3	4	6	3
2	6	8	6	5	4	6	7
4	3	3	8	8	4	6	5
2	3	5	7	3	4	6	4
—	—	—	—	—	—	—	—

LESSON XCVIII.
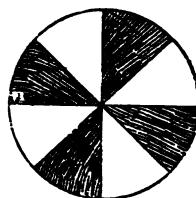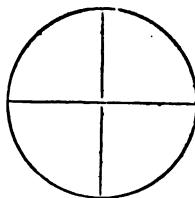
COMPLETE:

$1 = \frac{}{4}$	$1 = \frac{}{8}$	$1 - \frac{3}{4} =$	$2 = \frac{}{4}$
$\frac{1}{2} = \frac{}{4}$	$\frac{1}{2} = \frac{}{8}$	$1 - \frac{1}{4} = \frac{}{8}$	$2 - \frac{3}{4} =$
$\frac{1}{2} + \frac{1}{4}$	$\frac{1}{4} = \frac{}{8}$	$1 - \frac{3}{4} = \frac{}{8}$	$2 - \frac{3}{8} =$
$1 - \frac{3}{4}$	$\frac{2}{4} = \frac{}{8}$	$\frac{3}{4} + \frac{1}{8} = \frac{}{8}$	$1\frac{1}{2} - \frac{1}{4} =$

1. If 3 oranges be cut into fourths, how many pieces will there be ?

2. If 3 melons be cut into eighths, how many pieces will there be?

3. If there are $\frac{1}{4}$ of a melon on one plate, $\frac{3}{8}$ on another, and $\frac{5}{8}$ on another, how much more than one melon on the three plates?

4. One-fourth of a pie on one plate, three-fourths on another, one-half on another—how much in all?

5. If I use $\frac{1}{8}$ of a melon for a plate, $2\frac{1}{2}$ melons will make how many plates of dessert?

LESSON XCIX.
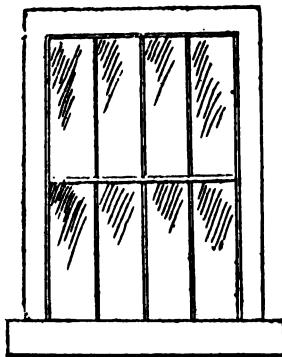
Draw this window. How many panes in it? In one-half of it? In one-fourth of it? In one-eighth of it? In three-eighths of it?

How many panes are there in 2 such windows? In three? In four?

How many more panes in $\frac{1}{2}$ of this window than in $\frac{1}{8}$ of it? In $\frac{3}{4}$ than in $\frac{3}{8}$ of it? In $\frac{3}{4}$ than in $\frac{1}{2}$ of it?

How does $\frac{1}{2}$ of it compare in size with $\frac{1}{4}$ of it? How does $\frac{1}{4}$ compare in size with $\frac{1}{8}$? How does $\frac{3}{4}$ compare in size with $\frac{6}{8}$?

LOOK AT THE PICTURE AS YOU COPY AND COMPLETE:

$$1 = \frac{}{8} \qquad \frac{2}{4} = \frac{}{8} \qquad \frac{1}{4} + \frac{1}{8} = \frac{}{8} \qquad \frac{3}{4} - \frac{1}{8} =$$

$$\frac{1}{2} = \frac{}{8} \qquad \frac{1}{2} + \frac{1}{8} = \frac{}{8} \qquad \frac{1}{4} + \frac{3}{8} = \frac{}{8} \qquad 2 = \frac{}{8}$$

$$\frac{1}{4} = \frac{}{8} \qquad \frac{1}{2} + \frac{3}{8} = \frac{}{8} \qquad \frac{1}{2} - \frac{1}{4} = \frac{}{8} \qquad 1\frac{6}{8} =$$

$$\frac{3}{4} = \frac{}{8} \qquad \frac{1}{4} + \frac{1}{8} = \frac{}{8} \qquad \frac{1}{4} - \frac{1}{8} = \frac{}{8} \qquad 2\frac{3}{4} =$$

LESSON C.

8 in.
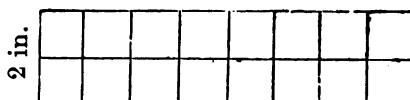
1. Draw a rectangle 2 inches wide and 8 inches long. Lay it off as in this picture. One-eighth of the rectangle is how many square inches? $\frac{2}{8}$? $\frac{4}{8}$? $\frac{6}{8}$? One-fourth of the rectangle is how many eighths of it? Three-fourths of it is how many eighths?

2. Draw a square 4 inches on each side. Lay it off into eighths. One-eighth of it is how many square inches? $\frac{2}{8}$? $\frac{5}{8}$? $\frac{7}{4}$? ,

3. Draw this octagon.
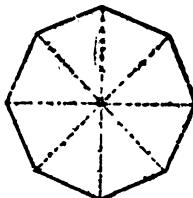
Join the opposite angles by dotted lines. The octagon is now divided into how many triangles? Five of these triangles are what part of the octagon?

ANSWER IN WRITTEN EQUATIONS.

1. If a pound of pepper costs 24 cents, what will $\frac{1}{4}$ of a pound cost? $\frac{1}{8}$ of a pound? $\frac{3}{8}$ of a pound?

2. How many inches longer is $\frac{1}{4}$ of a piece of ribbon 32 inches in length, than $\frac{1}{8}$ of it?

3. Nine of my lilies are in bloom, and they are $\frac{1}{4}$ of what I have. How many plants are there in all?

Write a story for $\frac{1}{8}$ of 24 cents=?

LESSON CI.

o o   o o   o o ——.

Here are ¾ of Walter's marbles. How many has he?

o o o   o o o   o o o   o o o   o o o — — —

Here are ⅝ of Harry's marbles. How many has he?

o o

These two marbles are ⅛ of what Allen has. Make a picture that will show ⅞ or all of them.

||| ||| |||

Here are ⅜ of the sticks on Ella's desk. Make a picture of ⅝ or all of them.

‖   ‖   ‖   ‖

Here are ½ of the sticks on Robert's desk. Draw all of the sticks, or ⅝ of them. Draw 24 circles and separate them into eight groups. Put a line through ⅜ of the circles. Draw 32 circles and put a line through ¼ of them.

△ △ △ △ △ △ △ △ △

These nine triangles are ⅜ of all that Ida cut from a sheet of colored paper. How many triangles were there in all?
If ⅜ of the roses in a bowl are 9 roses, ⅛ of them are how many roses? How many roses in all?

LESSON CII.

DRILL FOR COMBINATIONS ENDING IN SEVEN.

1. What number added to each will make 17?

   6   9   8   4   5   3   12   2   7   11   10   13

2. What added to each will make 27?

16   19   18   14   15   13   12,   22   17   11   7   8

3. What added to each will make 37?

26   29   28   24   25   23   22   32   27   11   17   13

LESSON CII.

STUDY TILL YOU CAN ADD RAPIDLY:

A	B	C	D	E	F	G	H
7	6	8	8	8	8	6	9
5	3	6	2	2	7	4	5
5	4	4	8	8	9	9	9
6	3	5	2	2	2	4	8
4	2	5	6	9	8	7	6
7	8	6	4	3	2	3	4
3	5	3	8	4	4	4	5
2	6	8	5	2	5	3	6
5	6	5	4	9	8	6	6

1. Jennie has finished nine aprons, which are $\frac{1}{4}$ of what she had to make. How many did she have to make?

2. Nine towels are $\frac{1}{4}$ of how many dozen?

3. Marion brought me 18 roses, half of all she had. How many did she have at first?

4. Kate has spent seven dollars, $\frac{1}{3}$ of her money. How much did she have at first? How much has she now?

5. Ten of my pupils are boys, and these are $\frac{1}{3}$ of my class How many pupils do I have?

6. If $\frac{1}{8}$ of a rectangle is 4 square inches, how many square inches in the whole rectangle?

7. John spent 3 dollars, which was $\frac{1}{8}$ of his week's earnings. Can you tell how much he saved?

8. If only 9 pupils, or $\frac{1}{4}$ of the class, are at the blackboard, how many are at their seats?

9. If 2 melons are cut into eighths and 4 into quarters, how many pieces will there be?

10. If $\frac{1}{8}$ of a melon is placed on every plate, $2\frac{1}{2}$ melons will be enough for how many plates?

CHAPTER VIII.

NUMBERS FROM THIRTY-EIGHT TO FORTY.

LESSON CIII.

THE SQUARE YARD.
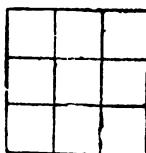
Let this picture represent a square, one yard on a side.

How many square feet in a square yard?

One square foot is what part of the square yard?

Two square feet are what part of it ?

Three square feet?

Two-thirds of the square yard are how many ninths of it?

If a two-foot square be taken out, how many ninths will be left?

Two-thirds of the square yard and two ninths of it are how many square feet ?

How long must an oblong one foot in width be to contain as many square feet as this figure?

Measure off and draw on the floor a square yard.

LESSON CIV.
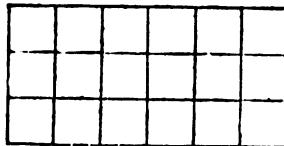
Let this represent a rectangle two yards long and one yard wide. How many square yards in this rectangle?

Two square yards contain how many square feet?

How many oblongs of two square feet in this rectangle?

What is ½ of 2 square yards?

What is ⅔ of 18 square feet?

How many rectangles 2 feet by 3 feet in this rectangle?

What is ⅓ of 2 square yards?

How many square feet in ¾ of this rectangle?

COPY AND COMPLETE:

1 sq. yd.= sq. ft.	⅔ of 2 sq. yd.=
½ of 1 sq. yd.=	⅓ of 2 sq. yd.=
¾ of 1 sq. yd.=	2 sq. yd.—10 sq. ft.=
1 sq. yd.—5 ft.=	2 sq. yd.—5 sq. ft.=
2 sq. yd.=	3 sq. yd.=
½ of 18 sq. ft =	⅓ of 27 sq. ft.=
⅓ of 2 sq. yd.=	⅔ of 27 sq. ft.=

LESSON CV.

a   e   b

c   d
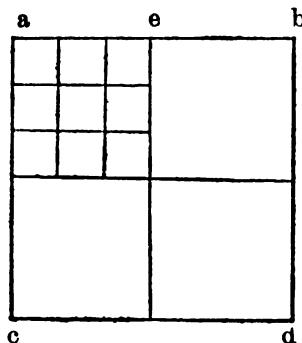
From *a* to *e* represents 3 ft.; from *e* to *b*, 3 ft.

How long is the line *a b* ? How many feet from *a* to *d* ?

How many feet long is the bounding line of the whole square?

How long is one-half of the bounding line ?

How many square yards in the square?

Nine square feet is what part of the square?

How many rectangles 3 feet wide, 6 feet long, do you see ?

One-half the square is how many square feet?

How many square feet in the whole square?

How many square feet in three-fourths of it?

COPY AND COMPLETE :

4 sq. yd.=   sq. ft.   ¼ of 36 sq. ft.=

4 sq. yd.÷9 sq. ft.=   ½ of 36 sq. ft.=

4 sq. yd.÷18 sq. ft.=   ¾ of 36 sq. ft.=

¾ of 4 sq. yd.=   sq ft.   4 sq. yd.—9 sq. ft.=   sq. yd.

¼ of 4 sq. yd.=   sq. ft.   4 sq. yd. —9 sq. ft.=   sq. ft.

LESSON CVI.

Let 1 inch represent a yard, and on this scale, draw the following:

1. A rectangle 1 yd. wide and 2 yds. long. How many square feet in this rectangle?

2. A rectangle 1 yd. by 3 yds. Lay it off into square feet. How many square yards? How many square feet?

3. My closet floor, which is 6 ft. wide, 9 ft. long. How many yards of oil-cloth a yard wide will cover it?
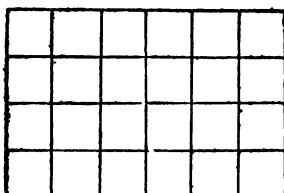
A rectangle 4 ft. wide, 6 ft. long, contains how many sq. ft.? How many sq. yds.?
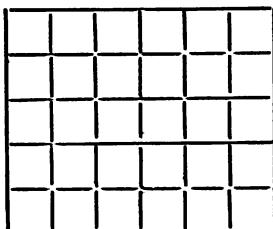
A rectangle 5 ft. wide, 2 yds. long, contains how many sq. ft.? One-fifth of this rectangle is how many sq. ft.? Three-fifths of it are how many sq. ft.?

How many feet in the boundary of an oblong 4 yds. long and 2 yds. wide?

How much braid will bind a rug 4 yds. long and 3 yds. wide, allowing a quarter of a yard extra for turning the corners?

LESSON CVII.

COMPLETE :

XXXVII	$2\times18=$	$\frac{1}{2}$ of $36=$
$2\times15+$ $=37$	$2\times19=$	$\frac{1}{2}$ of $37=$
$4\times9+$ $=37$	$\frac{1}{2}$ of $32=$	$\frac{1}{2}$ of $38=$
$37-27=$	$\frac{1}{2}$ of $34=$	XXXVIII$=$
$37-20=$	$\frac{1}{2}$ of $35=$	$38-6\times6=$

ANSWER IN WRITTEN EQUATIONS :

1. I ordered $2\frac{1}{2}$ dozen roses, but **Mary** brought me 7 more than that number; how many ?

2 A cord 37 inches long is cut in half; how long is each piece?

3. What must Bertha pay for 3 note-books at 9 cents apiece, and 2 pencils at 5 cents each?

4. Rhoda has 38 tulip bulbs. If planted in circles of the same size, how many will be in each?

5. Lewis had 37 cents in his bank and took out a nickel and 2 dimes; what remained?

WRITE PROBLEMS FOR THESE :

$$\frac{1}{2} \text{ of } 34=? \qquad (37-5)\div2=?$$
$$37-4\times8=? \qquad \frac{1}{4} \text{ of } 36=?$$

LESSON CVIII.

COMPLETE :

$2\times13=$	$39\div13=$	$\frac{1}{3}$ of $36=$
$3\times10+3\times3=$	XXXIX$=$	$\frac{1}{3}$ of $39=$
$3\times13=$	$6\times6+\frac{1}{2}$ of $6=$	$\frac{2}{3}$ of $39=$
$26\div13=$	$39\div6=$	$4\times8+?=39$

ANSWER IN WRITTEN EQUATIONS :

1. Ruth, May and Jessie called for a dozen "lady-fingers" apiece, but the baker put an extra cake into each little girl's basket. How many did they all get?

2. Walter picked $3\frac{1}{4}$ dozen fine pears. He sold $\frac{1}{2}$ of them at 2 cents apiece. What did he get for them?

3. How many tulips has old Roger, the gardener, if he has enough to put 16 on each side of the walk and give Alice and Roy 4 apiece for their garden?

LESSON CIX.

•

BY PICTURES SHOW:

1. The tens in forty.
2. The eights in forty.
3. One-fourth of forty.
4. Three-fourths of forty.

COPY AND COMPLETE.

$40 \div 20 =$	$\frac{1}{4}$ of $40 =$	$\frac{1}{8}$ of $40 =$
$40 \div 10 =$	$\frac{2}{4}$ of $40 =$	$\frac{3}{4}$ of $40 =$
$40 \div 8 =$	$\frac{3}{4}$ of $40 =$	40 in.—1 yd.$=$
$40 \div 5 =$	$\frac{1}{8}$ of $40 =$	40 oz.$=2$ lbs.$+$?
$40 \div 4 =$	$\frac{3}{8}$ of $40 =$	40 qts.$=$? gals.
$40 \div 2 =$	$\frac{5}{8}$ of $40 =$	40 pts.$=$? gals.

Answer without using your slate and pencil:

1. Forty eggs are how many dozen and what part of another?

2. What will 40 apples cost at the rate of 9 cents a dozen?

3. When bananas are 5 cents apiece what part of a dozen will 40 cents buy?

4. I have 40 roses; $\frac{3}{4}$ of them are white, the others red; how many are there of each kind?

5. There were 40 pears in a basket and $1\frac{1}{2}$ dozen were taken out; how many were left in the basket?

LESSON CX.

1. Write by twos through 40. By fours. By fives. By eights. By tens.

2. How many fours in each of these?

   16   28   32   24   36   40   32   20

3. How many fives in each of these?

   20   30   40   15   25   35

4. What is one-half of:

   20 24 22 28 26 30 32 36 34 38 40?

5. How many threes in each of these?

   21   18   12   24   27   36   30   33   39

1 Chester earns $13 a week and spends $9. In how many weeks can he save $40?

2. I bought 2 chickens for 20 cents apiece and gave the boy two quarters; what change did he return?

3. Wilbur had 40 cents and spent three nickels; how many street-car tickets at five cents apiece can he buy with the rest of his money?

4. What must be paid for 2½ yds. of ribbon at 16 cts. per yd.?

Make a problem for 1¼×24c.=?

.

LESSON CXI.

COMPLETE.

XL=	$2\times20+1=$	$41-20=?\times7$
XLI=	$25+5+$ $=41$	$41-26=.$
XLV=	$41=20+$	$41-5=?\times6$
XLVII=	$41=25+$	$28+?=41$

ANSWER IN WRITTEN EQUATIONS:

1. Alma has in her bank a quarter of a dollar, three 5-cent pieces, and a copper cent. That is how much money?

2. 41 inches are how many more than 1 yard?

3. How many bushels in 41 pecks?

4. From a band 41 inches long, 2 feet was cut. How long was the piece that remained?

6. What is the difference between 41 apples and 3 dozen apples?

5. What is the difference between 41 days and 5 weeks?

7. 41 months are how many more months than 2 years?

8. Forty.one splints will lay 4 pentagons and how many triangles?

9. Forty-one sticks will lay 6 pentagons, 2 squares, and what other figure?

10. Mr. Jarrett had 50 dollars. He bought 3 calves at $7 apiece, and 4 sheep at $5 apiece. How much of his money was left?

LESSON CXII.

```
X X   X X   X X
X X   X X   X X
X X   X X   X X
X X   X X   X X
X X   X X   X X
X X   X X   X X
X X   X X   X X
```

Draw these crosses. Let us play that they are trees in an orchard. The first 2 rows are cherries; the next two, peaches; the last two, apples.

1. How many trees of each kind? How many trees in all? The cherry trees are what part of the orchard? Two-thirds of all the trees are how many?

2. One-sixth of the orchard is how many trees? Three-sixths? Four-sixths? Five-sixths?

3. If half of these trees are young, how many are old?

4. If the cherry trees yield, on an average 1½ bushels to the tree, how many bushels will there be?

5. The peach trees average 2 bushels; how many bushels of peaches?

6. If ⅓ of these trees were cut down, how many trees would remain?

7. What is ½ of 42? ⅔ of 42? ⅚ of 42?

COMPLETE.

$42 = \quad \times 7$	$42 \text{ wk} = \quad \text{da.}$
$42 = \quad \times 6$	$8 \text{ wk} + \quad = 42 \text{ da.}$
½ of $42 =$	$43 \text{ in.} = 1 \text{ yd} +$
⅔ of $42 =$	$8 \text{ ft.} + \quad = 42 \text{ in.}$
⅗ of $42 =$	$42 \text{ in.} = 1 \text{ yd.} +$
$24 = $ ½ of	$42 \text{ pt.} = \quad \text{qt.}$
	$42 \text{ qt.} = \quad \text{gal.}$
	$42 \text{ oz.} - 1 \text{ lb.} = \text{oz.}$
$30 = {}_7 \text{ of } 42$	$3 \text{ dozen} + \quad = 42$
⅚ of $42 =$	½ of $36 =$
⅛ of $42 =$	⅔ of $36 =$
⅞ of $42 =$	¾ of $40 =$
	$2 \times 14 =$
$7 = \quad \text{of } 42$	$28 + 14 =$
$14 = \quad \text{of } 42$	$3 \times 14 =$

LESSON CXIII.

Write the equal numbers in each of the following numbers:

| 36 (*seven*) | 40 (*six*) |
| 39 (*two*) | 42 (*six*) |

Write the even numbers in order from 20 through 42. Write the odd numbers from 13 to 41.

REVIEW PROBLEMS.

1. Find the cost of two pineapples at 15 cents apiece and a dozen figs at a cent apiece.

2. Grandma is making patchwork. She uses 3 red and 8 white pieces of calico for a star. Seven stars contain how many pieces?

3. When cheese is 20 cents a pound, how much can be bought for 25 cents?

4. If a quarter of a pound of fruit is used for a cake, how many pounds will it take for 9 cakes?

5. Mary has hemmed 24 towels which are two-thirds of what she had to hem; how many in all?

6. George had 34 white rabbits. Five died, and 10 pairs were sold; how many were left?

7. Willie bought a bicycle for $30 and sold it to Henry for one third more than it cost; what did he get for it?

8. Walter had 3 dozen and 4 marbles. He sold half of them and gave Julian 8; how many remained?

9. How does a box that will hold 14 pecks compare in size with one that will hold 7 bushels?

10. What is the difference between 45 cents and 18 cents?

LESSON CXIV.

COMPLETE:

XLIII=	43—9×4=
43=8×5+	43in.—1yd.=
43=28+	43—6×7=
43—5×4=	43—3×12=
43—6×5=	43—4×8=
43—6×6=	43c.=25c.+10c. +

1. 2 squads of 10 boys each and a leader to each squad; how many in all?

2. Eva bought 2 dozen and 9 peaches and distributed them equally among 3 children; how many for each child?

3. I give to each of 5 little girls a bundle of ten small splints and 1 large one; how many splints all together?

4. Ella bought muslin at 11 cents a yard. She gave the clerk 40 cents and he returned her 7 cents. How many yards did she buy?

COMPLETE:

2×11=	44=	×11	$\frac{1}{3}$ of 21+$\frac{1}{4}$ of 28=
3×11=	55=	×11	$\frac{2}{3}$ of 15+$\frac{3}{4}$ of 40=
4×11=	66=	×11	$\frac{1}{6}$ of 30+$\frac{1}{6}$ of 42=
5×11=	77=	×11	$\frac{2}{5}$ of 25+$\frac{5}{6}$ of 12=

LESSON CXV.

1. Flora puts 10 red beads and 5 black ones into each of two boxes; how many beads?

2. 10 circular tablets and 5 oblongs in each of 3 borders; how many all together?

3. 45 cents will buy how many pine-apples at 15 cents apiece?

4. Florence made a dozen button-bags; she gave Amory 3 and sold the others at 5 cents apiece; what did she get for them ?

5. A dressmaker has 3 bolts of ribbons, 15 yd on each; how many dresses will that trim if she uses 9 yd on each dress?

5 YD.

1 YD.
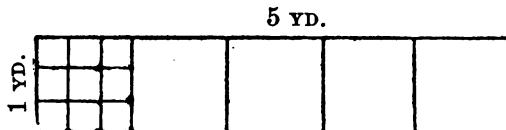
Let this picture represent a rectangle 1 yd. wide and 5 yds long.

How many square yards in the rectangle? How many square feet?

3 sq. yds. is what part of the rectangle?

27 sq. ft. is what part of it?

If 1 sq. yd. be erased, how many square feet will remain?

If $\frac{3}{5}$ of it be erased, how many square feet will remain?

COMPLETE.

$2 \times 12 =$	$\frac{1}{3}$ of $45 =$	$45 - 36 =$
$3 \times 15 =$	$\frac{2}{3}$ of $45 =$	$45 - 15 =$
$45 \div 9 =$	$\frac{1}{9}$ of $45 =$	45 da. $+$ 5 wk. $=$
$45 \div 5 =$	$\frac{4}{5}$ of $45 =$	45 in. $- \frac{1}{2}$ yd. $=$

LESSON CXVI.

COMPLETE.

$$46=4\times10+ \qquad 44=2 \text{ score}+$$
$$47=20+ \qquad 46-3\times15=$$
$$3 \text{ doz.}=46- \qquad 47-6\times7=$$

1. If 3 quarts of milk sell for 30 cents, how much is that for a pint?

$$3 \text{ qt.}=24 \text{ ct.}$$
$$1 \text{ qt.}=$$
$$1 \text{ pt.}=$$

2. If 2 yards of elastic sell for 18 cents, what is that a foot?

$$2 \text{ yd.}=18 \text{ ct.}$$
$$1 \text{ yd.}=$$
$$1 \text{ ft.}=$$

3. If 5 yards of wire sell for 45 cents, what will be the price of 1 ft?

4. If 5 pecks of cotton seed cost 30 cents, what is that for a bushel?

$$5 \text{ pk.}=30 \text{ ct.}$$
$$1 \text{ pk.}=$$
$$1 \text{ bu.}=$$

5, When berries are 30 cents, a quart, what should be the price of a half-gallon?

6. Goobers are 20 cents. a quart; how much will 7 pints cost?

7. Five apples sell for 15 cents; at that rate what must be paid for a dozen?

8. 3 pecks of green peas sell for 36 cents, at the same rate what will a bushel sell for?

9· 3 lbs. of zephyr cost 60 cents, what should an 8 ounce package cost?

10. When potatoes are 40 cents a bushel, what should 5 pecks cost?

CHAPTER IX.

NUMBERS FROM FORTY-EIGHT TO SIXTY.

LESSON CXVII.

```
o o o o    o o o o    o o o o    o o o o
o o o o    o o o o    o o o o    o o o o
o o o o    o o o o    o o o o    o o o o
```

How many circles in each group?   How many in all
How many in 2 groups?   In 3 groups?

How many groups are there?

How many groups of 4?

How many vertical rows of 3?

How many circles in a long horizontal row?   In 2 horizontal rows?

COMPLETE:

$$12+12+12+12= \quad 3\times16= \quad \tfrac{1}{2} \text{ of } 48=$$
$$48\div12= \quad 48\div16= \quad \tfrac{1}{4} \text{ of } 48=$$
$$48-24= \quad \tfrac{1}{8} \text{ of } 48= \quad \tfrac{2}{4} \text{ of } 48=$$
$$48\div24= \quad \tfrac{2}{8} \text{ of } 48= \quad \tfrac{3}{4} \text{ of } 48=$$
$$48-12= \quad 48-16 \quad 48\div3=$$

LESSON CXVIII.
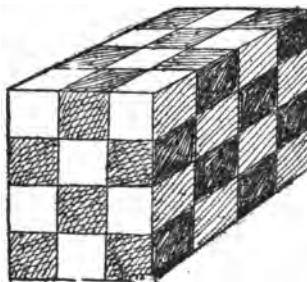
This prism is made of inch cubes.

How many faces has the prism? How many edges?

How long is each vertical edge?

How many square inches on the vertical face in front?

How many square inches on the upper base, or top?

How many layers of blocks, or cubes, form the prism?

How many blocks in each layer?

How many blocks in the prism?

If I take off the top layer of blocks, how many will be left?

If I take off two layers how many?

One layer of blocks is what part of the prism?

COMPLETE:

24+24=	2×16=	48 oz.= ? lb.
4×12=	3×16=	48 pk.= ? bu.
3× 8=	48—5×9=	48 qt. =? gal.
6× 8=	48÷9=	48 yr.=? mo.
48÷8=	48—6×7=	48 in.= ? ft.
48÷6=	48÷7=	48 in.—3 yd.=? in.

Write all the equal numbers in 48.

·LESSON CXIX.

1. Alice Gray leads our class in marching. There are 24 couples behind her; how many pupils in the class?

Our school-room has just enough single desks for the class, and these are arranged in 7 rows. How many desks in each row?

Three-sevenths of the class are in Section I., the rest in Section II. How many in each class?

How many pupils are five-sevenths of the class?

2. I left Atlanta, Ga., 6 o'clock Monday morning and reached Chicago 6 o'clock Tuesday evening; how many hours did I travel?

How many hours from 6 o'clock Thursday morning to 7 o'clock Friday evening?

3. There are 24 sheets of paper in 1 quire; how many sheets in 2 quires?

Six sheets are what part of a quire?

If I pay 5 cents for 6 sheets of legal-cap paper, how much should I pay for a quire?

If 6 sheets of colored tissue paper cost 10 cents what will 48 sheets cost?

Write problems for these:

$$48 \div 8 = ? \qquad 49 - 4 \times 12 = ?$$

COMPLETE:

XXIX=	35 days + ? = 7 weeks.
XXXIX=	49 in. — 4 ft. =
XLIX=	48 sheets of paper = ? quires.
XIX=	49c. — 4 dimes =
49 = ? × 7	49c. — 9 × 5c. =
14 = $\frac{1}{7}$ of 49	49c. — 25c. =
21 = $\frac{1}{7}$ of 49	2 days = ? hours.
28 = $\frac{1}{7}$ of 49	?0 + ? = 49.

LESSON CXX.

Write all the equal numbers in 50. Make a picture to show that $5 \times 10 = 50$.

```
O O    O O    O O    O O    O O
O O    O O    O O    O O    O O
O O    O O    O O    O O    O O
O O    O O    O O    O O    O O
O O    O O    O O    O O    O O
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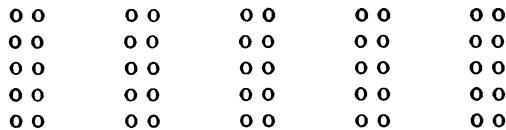
1. How many groups of rings in the picture? How many rings in each group? How many rings in all?

2. Ten rings are what part of all? Twenty rings are how many fifths of all? Three-fifths of all the rings are how many? Four-fifths?

3. Let us play that these rings are cuff-buttons; how many pairs are there?

4. Let us play that half of the rings are oranges and the others apples; how many apples?

COMPLETE:

L=	$\frac{1}{5}$ of 50=	$12 \times 4 + \frac{1}{2}$ of 4=
$5 \times 10=$	$\frac{2}{5}$ of 50=	$50 \div 4=$
$50 = 2 \times 20 +$	$\frac{3}{5}$ of 50=	50 da. =7 wk.+ ?
$50 \div 2=$	$40 = \frac{}{5}$ of 50	2 da. +2 hr.=? hr.
$\frac{1}{2}$ of 50=	$20 = \frac{}{5}$ of 50	16 yd.=? ft.
$25 + ?=50$	$30 = \frac{}{5}$ of 50	50 ft.=? yd.

LESSON CXXI.

1. How many 25 cent pieces should you give for 50 cents? How many should you give for a dollar?

2. Twenty-five cents is what part of a dollar?

3. Fifty cents is what part of a dollar?

4. How many dimes make 50 cents? How many nickels should you give for a half dollar?

5 Harold has four coins in his purse which together makes 50 cents; what are they?

6. Julia has 50 cents, but her money is in nickels and dimes. She has 4 nickels; how many dimes?

7. At a half-cent apiece what will 10 figs cost? 50 figs?

8. At 2 cents apiece how many apricots can I buy for 50 cents?

9. I can buy 4 slate pencils for a nickel; how many for 25 cents? For 50 cents?

10. Jennie bought 6 cocoanuts at 7 cents apiece, and handed the clerk two quarters. What change did she receive ?

Write problems for 50c.÷5c.=?   50c.—6×5c.=?

LESSON CXXII.

DRILL ON COMBINATIONS ENDING IN EIGHT.

1. What number added to each will make 18?

    6   9   7   4   13   2   11   5   8   12   10

2. What added to each will make 28?

    26   19   17   14   13   12   11   15   18   2   10   16

3. What added to each will make 38?

    19   17   15   13   11   9   7   5   18   16   14   12   10

4. What added to each will make 48?

    39   37   35   33   30   32   34   36   38   28

ADD RAPIDLY:

A	B	C	D	E	F	G	H
6	3	9	9	6	2	6	7
4	4	7	2	4	9	4	9
6	3	3	8	9	9	9	4
4	7	6	4	4	6	3	7
7	3	4	6	7	6	8	6
3	7	6	5	9	6	3	4
2	4	3	7	4	9	8	3
6	7	9	6	5	3	7	5
—	—	—	—	—	—	—	—

LESSON CXXIII.

DRILL ON COMBINATIONS ENDING IN NINE.

1. What added to each will make 19?

    16   17   13   15   14   12   10   11   8   9   7   4

2. What added to each will make 29?

    26   27   25   14   15   13   12   7   19   18

3. What added to each will make 39?

    26   28   23   27   21   24   22   25   29   19

4. What added to each will make 49?

    36   38   33   37   31   34   32   35   29   10   17

ADD RAPIDLY:

A	B	C	D	E	F	G	H
4	2	6	4	4	6	5	8
8	8	5	6	5	4	4	5
2	4	4	2	2	2	5	7
6	6	7	8	8	8	4	8
4	7	3	6	4	2	9	3
7	3	8	4	6	8	2	9
3	4	3	6	5	3	8	6
2	7	9	5	7	8	6	7
7	8	9	8	7	8	5	6

LESSON CXXIV.
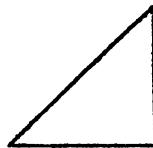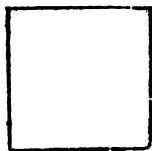
These pictures represent a four-inch square and a triangle half the size of the square. Copy neatly and complete.

THE TRIANGLE AND THE SQUARE.

I. LIKENESSES.

1. Each of these figures is a ———.
2. Each has ———.
3. Each has ———.
(Write some other likeness, if you can.)

II. DIFFERENCES.

1. The square has —— sides; the triangle has ——.
2. The square has —— angles; the triangle has —— ——.
3. All the sides of the square are ——; two sides of this triangle are ——.
4. One side of this triangle is —— than any side of the square.
(Write other differences)

LESSON CXXV.

RAPID SIGHT-WORK.

GIVE THE SUM:

6	7	6	2	5	8	6
9	4	3	7	8	9	9
8	9	8	4	7	9	3

4	7	8	6	7	4	7
5	7	9	7	8	9	7
8	9	8	6	3	7	8

GIVE THE DIFFERENCE:

16	18	14	20	13	17	15
9	7	5	16	4	9	8

MULTIPLY:

6	9	7	9	4	7	6	12	12	25
8	3	4	4	8	7	6	3	4	2

12	11	13	15	16	14	13	25	15
1	4	2	2	2	2	3	2	3

DIVIDE:

3 | 24   8 | 24   12 | 48   25 | 50   10 | 50   2 | 50   5 | 50

15 | 30   8 | 32   16 | 32   17 | 34   9 | 36   18 | 36   3 | 36

16 | 48   8 | 48   5 | 45   9 | 45   15 | 45   3 | 45   2 | 40

LESSON CXXVI.

TIME.
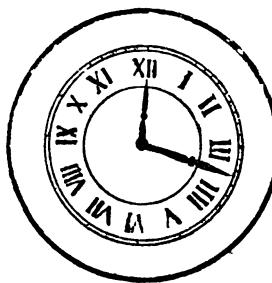
How many minutes in 1 hour?   In a half hour?   In a quarter of an hour?

Three-quarters of an hour is how many minutes?

Twenty minutes is what part of an hour?

Five minutes is what part of an hour?

Dora came to see me at 20 minutes past 9, and stayed till 10.   How long was her visit?

Carrie has to practice an hour and a half every day. This morning she practiced from 8 o'clock until 10 minutes before 9.   How much longer has she to practice ?

A train passes our door every 45 minutes.   How many will pass in 3 hours ?

Draw a clock face and set the hands at 25 minutes past 3.

COMPLETE :

1 hr.= min.	1 hr.+10 min.=
½ hr.=	1½ hr.=
¼ hr.=	1 hr.—35 min.=
½ hr.+15 min.=	1 hr.—40 min.=
45 min. = ? hr.	1 hr.—18 min.=

LESSON CXXVII.

COMPLETE:

$60 \div 30 =$	$60 \div 6 =$	$60 - 30 =$
$60 \div 20 =$	$60 \div 5 =$	$60 - 15 =$
$60 \div 15 =$	$60 \div 3 =$	$60 - 45 =$
$60 \div 10 =$	$60 \div 2 =$	$60 - 20 =$

How many seconds in 1 minute? In a half minute? In a quarter of a minute?

If a boy can write 30 words a minute, how many can he write in 30 seconds?

A train that moves at the rate of half a mile a minute, will go how far in an hour?

If the big mill-wheel turns twice in five minutes, how often will it turn in an hour?

COPY AND LEARN:

60 seconds = 1 minute.	12 months = 1 year.
60 minutes = 1 hour.	52 weeks = 1 year.
24 hours = 1 day.	365 days = 1 year.
7 days = 1 week.	366 days = 1 leap year.
30 days = 1 month.	100 years = 1 century.

"Thirty days hath September,
April, June, and November.
Thirty-one the others rate,
But February hath twenty-eight.
Twenty-eight, yet this, in fine,
One year in four hath twenty-nine."

LESSON CXXVIII.

SURFACES.
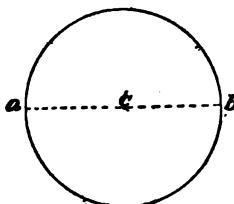
A CIRCLE.

The boundary of a circle is called its *Circumference*. Are all parts of the circumference the same distance from the center?

The line a b is a *Diameter*. Draw another diameter. Are all the diameters of a circle equal?

The line c b is a *Radius*. What other line is a radius? Are all the radii of a circle equal?
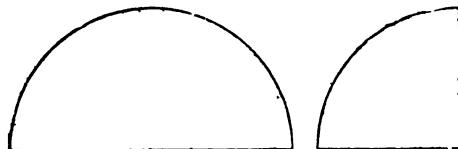
A Semi-Circle.　　A Quadrant.

Cut from paper a circle four inches in diameter. Fold it in half. What do you call the surface that you see?

Fold the right corner of the semi-circle over upon the left corner. What do you call the surface that you now have?

The semi-circle has how many curved edges? The quadrant has how many?

The semi-circle has how many straight edges? The quadrant has how many?

Which has a right angle?

Write all the likenesses between the semi-circle and the quadrant. Write all the differences.

LESSON CXXIX.

SURFACES.
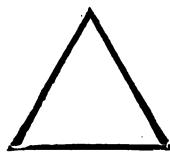
Equilateral.   Isosceles.   Scalene.
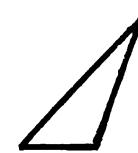
Which triangle has its three sides equal?
Which has only two sides equal?
Which has all of its sides unequal?
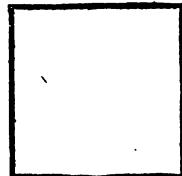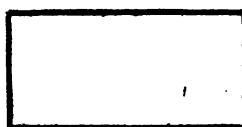
Square.   Rectangle.

In what ways are the Square and the Rectangle alike?
In what ways are they different?
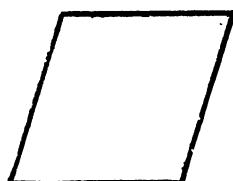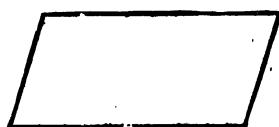
Rhombus.   Rhomboid.

The Rhombus has how many equal sides?
In the Rhomboid which sides are equal?
Are the angles of the Rhombus like those of the Rhomboid?
Cut these figures from white paper.

LESSON CXXX.

COPY AND COMPLETE:

The Square and the Rhombus.
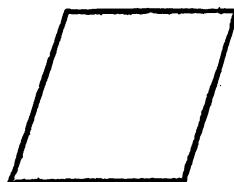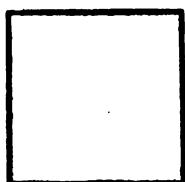
Likenesses.

Each is a plane ——————
Each has —————— sides and —————— angles.
All the sides of the Square are ——————.   All the sides of
the Rhombus are ——————.

Differences.

(*Write all the Differences you can find.*)

The Rectangle and the Rhomboid.

(*Write the likenesses and the differences.*)

CHAPTER X.

NUMBERS FROM SIXTY TO ONE HUNDRED.

LESSON CXXXI.
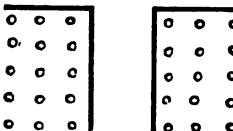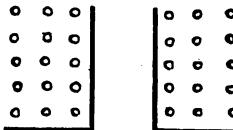
Dora made a flower garden on her desk, using buttons
for flowers and colored sticks for the walks.

How many buttons are there in each group?

How many in two groups?

Three-fourths of all are how many?

How many in all?

How many rows of ten are there?

How many rows of six do you see?

How many rows of three are there?

When the buttons were bought they were on two cards
like these.
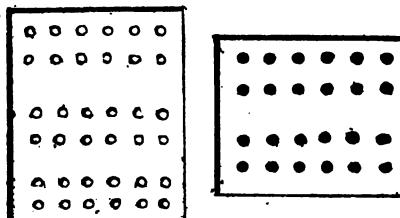
How many dozen on the two cards? How many white
buttons? How many black ones? How many twelves
in sixty? Thirty-six and what are sixty?

COMPLETE:

$60 = ? \times 30$	$60 = ? \times 12$	$\frac{1}{2}$ of $60 =$	$60 - ? = 40$
$60 = ? \times 15$	$60 \div 5 =$	$\frac{1}{4}$ of $60 =$	$36 + ? = 60$
$60 \div 10$	$60 = ? \times 6$	$\frac{3}{4}$ of $60 =$	$20 = —$ of 60
$60 \div 20$	$60 = ? \times 3$	$\frac{1}{3}$ of $60 =$	$15 = —$ of 60

LESSON CXXXII.
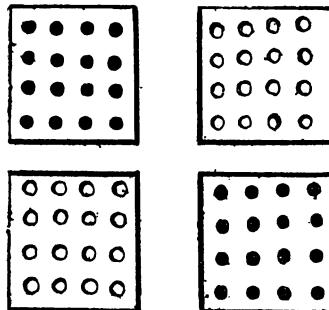
1. Henry made his garden this way. What is the shape of his garden? What is the shape of each group of buttons? How many in each group? How many in two groups? In three? How many buttons are black?

COMPLETE:

$8 \times 8 =$	$64 = ? \times 32$	$2 \times 8 =$	$\frac{1}{8}$ of $64 =$
$4 \times 16 =$	$64 = ? \times 16$	$4 \times 8 =$	$\frac{2}{8}$ of $64 =$
$2 \times 16 =$	$64 = ? \times 8$	$6 \times 8 =$	$\frac{3}{8}$ of $64 =$
$2 \times 32 =$	$64 = ? \times 4$	$8 \times 8 =$	$\frac{1}{2}$ of $64 =$

LESSON CXXXIII.

ANSWER IN WRITTEN EQUATIONS:

1. Sixty pigeons are how many pairs?
2. How many years are three-score years?
3. How many 5-cent pieces will make 60 cents?
4. Two pounds of spice are how many ounces?
5. How many ounces in four pounds?
6. Sixty pears at 5 cents a dozen will cost how much?
7. How many blank books at 15 cents apiece will 30 cents buy?
8. What will three such books cost?
9. Five dozen marbles divided equally among 4 boys will be how many for each?
10. How many square inches in a rectangle 8 inches square?

11. If an eight-inch square of paper is folded into an oblong one half as large, how many square inches on the surface of the oblong?

12. What will 60 bushels of corn be worth at a half dollar a bushel?

13. What will 64 bushels be worth at the same rate?
14. Sixty quarters are how many dollars?
15. What will 64 watermelons be worth at a quarter of a dollar apiece.

Write problems for these equations:

$$60 \div 15 = ? \qquad \tfrac{1}{4} \text{ of } 64 = ?$$
$$3 \times 15 = ? \qquad 64 \div 4 = ?$$

LESSON CXXXIV.

Draw 7 baskets with 8 eggs in each.

How many in all?

Mother put 10 buttons on each of 6 jackets. How many dozen buttons did she use?
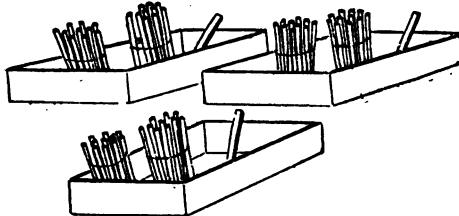
How many sticks in each box? How many sticks in all?

Seven groups of nine sticks each contain how many sticks?

What will 7 yards of muslin cost at 9 cents a yard?

What will 7 yards of calico cost at 8 cents a yard?
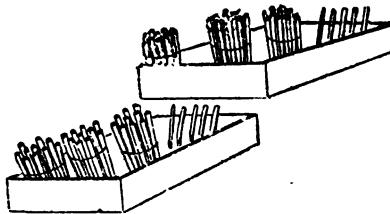
How many splints in each box? In both boxes? How many bundles of ten would all the splints make? Seventy boys will make how many couples?

COMPLETE:

$2\times7=$	$6\times7=$	$\frac{1}{4}$ of $28=$	$\frac{1}{7}$ of $56=$	$\frac{1}{4}$ of $60=$
$3\times7=$	$7\times7=$	$\frac{1}{5}$ of $35=$	$\frac{1}{7}$ of $63=$	$\frac{1}{2}$ of $70=$
$4\times7=$	$8\times7=$	$\frac{1}{7}$ of $28=$	$\frac{1}{7}$ of $70=$	$\frac{1}{9}$ of $63=$
$5\times7=$	$9\times7=$	$\frac{1}{7}$ of $35=$	$\frac{1}{7}$ of $49=$	$\frac{2}{9}$ of $63=$

LESSON CXXXV.
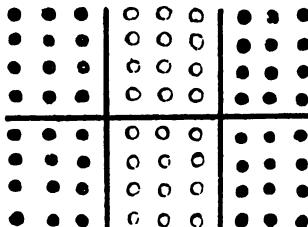
ANSWER IN WRITTEN EQUATIONS:

1. Six dozen buttons are how many?

2. Two dozen are white; what part of all are white?
ANS. One-third. $24 = \frac{1}{3}$ of 72.

3. Four dozen are black; what part of all are black?

4. One-sixth of all are how many?   ANS. $\frac{1}{6}$ of $72 =$ —.

5. Three-sixths of 72 are how many?

6. How many rows of 9 are there?   ANS. $72 \div 9 =$

7. How many rows of 8 are there? $72 \div 8 =$

8. Seventy-two geraniums will plant how many circles if there are to be 9 in each circle?

9. Seventy-two hyacinths will plant how many beds if 24 are put into each?

10. What will 72 apples cost at 10 cents a dozen?

11. Two yards are how many inches?

12. Seventy-two pints are how many gallons?

COMPLETE:

$2 \times 6 =$	$3 \times 8 =$	$2 \times 12 =$	$\frac{1}{2}$ of $72 =$	$\frac{1}{6}$ of $72 =$
$4 \times 6 =$	$9 \times 8 =$	$3 \times 12 =$	$\frac{1}{3}$ of $72 =$	$\frac{1}{9}$ of $72 =$
$12 \times 6 =$	$6 \times 6 =$	$6 \times 12 =$	$\frac{2}{3}$ of $72 =$	$72 \div 24 =$

LESSON CXXXVI.

1. Eighty boys marching in couples make how **many** couples?

2. Eighty cents are equal to how many dimes?

3. How many 5-cent pieces will make 40 cents? 80 cents?

4. Eighty panes of glass are enough for how many windows if 16 are used in each window?

5. What would 20 pounds of butter cost at a quarter of a dollar a pound? Forty pounds? Eighty pounds?

Make problems for these equations:

$$80 \div 20 = \ ? \qquad \tfrac{3}{4} \text{ of } 80 = \ ?$$
$$\tfrac{1}{2} \text{ of } 80 = \ ? \qquad 80 - 25 = \ ?$$

COMPLETE:

$2 \times 8 =$	3×8	$\tfrac{1}{3}$ of $24 =$	$\tfrac{3}{5}$ of $80 =$
$4 \times 8 =$	6×8	$\tfrac{2}{3}$ of $24 =$	$\tfrac{3}{8}$ of $80 =$
$5 \times 8 =$	9×8	$\tfrac{1}{4}$ of $40 =$	$\tfrac{4}{5}$ of $80 =$
$10 \times 8 =$	8×8		

LESSON CXXXVII.

1. Draw 9 rows of buttons, 9 in each row, and edge to edge.

What is the shape of the figure you have made? How many buttons are there in all? How many in three of the rows?

2. If 3 rows are black, 3 red, and 3 white, how many of each kind? How many of the red and white together? What is $\tfrac{1}{3}$ of 81? $\tfrac{2}{3}$ of 81?

3. Ten rows of 9 buttons are how many buttons?

4. How many sticks in each group? In both? If all these sticks were put into bundles of ten how many bundles would there be?

LESSON CXXXVIII.

ANSWER QUICKLY:

$2 \times 9 = ?$	$36 = ? \times 9$	$\frac{1}{2}$ of $30 = ?$
$3 \times 9 = ?$	$45 = ? \times 9$	$\frac{1}{2}$ of $50 = ?$
$6 \times 9 = ?$	$72 = ? \times 9$	$\frac{1}{2}$ of $70 = ?$
$9 \times 9 = ?$	$54 \div 9 = ?$	$\frac{1}{2}$ of $90 = ?$

1. How many square inches in a surface 6 inches wide and 9 inches long?

2. A shoemaker is putting buttons on four pairs of shoes; there must be 9 on every shoe, and he has 75 buttons; how many more are there than he needs?

WRITE PLOBLEMS FOR THESE:

$$90 \div 9 = ? \qquad \frac{1}{6} \text{ of } 54 = ?$$
$$81 \div 9 = ? \qquad \frac{1}{9} \text{ of } 72 = ?$$

LESSON CXXXIX.

COMPLETE:

1 dozen $=$	$84 \div 12 =$	2 yd. $=$ in.
2 doz. $=$	$84 + 12 =$	72 in. $=$ yd.
3 doz. $=$	$8 \times 12 =$	72 in. $=$ ft
4 doz. $=$	$96 \div 12 =$	$90 - 7 \times 12 =$
$5 \times 12 =$	7 yd. $=$ in.	$56 - 4 \times 12 =$
6 ft. $=$ in.	84 in. $=$ ft.	8 doz. $- 48 =$
$72 + 12 =$	2 yd. $=$ ft.	$\frac{1}{2}$ of $96 =$

GIVE WRITTEN EQUATIONS FOR THESE:

1. James gathered one hundred fine pears, he ate four of them, and sold the others; how many dozen did he sell?

2. Four dozen skeins of white and nine skeins of blue floss are how many?

3. What will Ella get for 72 figs if she sells them at 10 cents a dozen?

4. Fifty eggs in one basket and 22 in another are how many dozen?

5. Hugh arranges some blocks that are inch cubes into a prism 4 in. long, 3 in. wide, and 2 in. high. How many blocks in the prism? Draw it.

6. How many in two such prisms? Give problems for
$$84 \div 12 = ? \quad 8 \times 12 = ?$$

LESSON CXL.
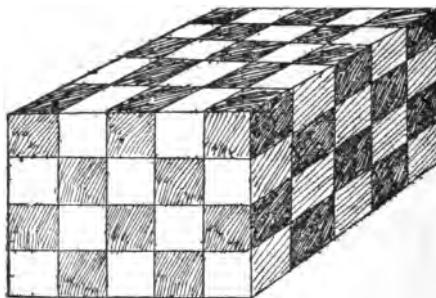
This prism is made of blocks that are inch cubes. How many square inches on the upper base? How many on the front face?

How many blocks in each of the four layers of blocks? How many in two of the layers? In three? In the entire prism?

COMPLETE:

$$100 = \begin{cases} ? \times 50 \\ ? \times 25 \\ ? \times 20 \\ ? \times 10 \end{cases}$$

$100 \div 5 =$
$100 \div 4 =$
One dollar = ? halves.
$1 = ? quarters.

$1 \div dimes =$
$1 \div nickels =$
$\frac{1}{3}$ of 75c. =
75c. $\div$ 5c. =

COMPLETE:

$$48 = \begin{cases} 2 \times 24 \\ \times 16 \\ \times 12 \\ \times 8 \\ \times 6 \\ \times 4 \\ \times 3 \\ \times 2 \end{cases} \qquad 50 = \begin{cases} 2 \times 25 \\ \times 10 \\ \times 5 \\ \times 2 \end{cases} \qquad 56 = \begin{cases} 2 \times 28 \\ \times 14 \\ \times 8 \\ \times 7 \\ \times 4 \\ \times 2 \end{cases}$$

RAPID SIGHT WORK. MULTIPLY:

6	10	7	12	16	15	14	14	25	25	25
8	5	6	4	3	3	2	4	2	3	4

Take ½ of	Take ¾ of	Take ⅗ of
28	16	25
30	28	50
40	24	30
50	40	15
56	48	45

Write all the equal numbers that make sixty, beginning with the largest.

Write the equal numbers that make 64.

LESSON CXLI.

REVIEW PROBLEMS.

1. Harriet sold 4 yards of crochet for 15 cents a yard, and with the money bought figs at a cent apiece. How many dozen did she buy?

2. Richard gathered 60 pears, kept 6, and sold the rest at 10 cents a dozen. What did he get for them?

3. How many sticks will lay 6 squares and 5 pentagons?

4. What will 4 quarts of berries cost at 7 cents. a pint?

5. Royal bought a buggy for $48, and sold it for ⅓ more than it cost him; what did he get for it?

6. Kate has 40 chestnuts, Maud ⅓ as many, and Lucian as many as both; how many does he have?

7. Julian had 4½ dozen pencils; he gave Frank 10 of them and sold 4 apiece to 3 boys. How many did he then have?

8. If the same train passes my door every six hours, how many times will it pass in 3 days?

9. Nine lilies have how many petals?

10. Four cats have how many toes?

11. Write all the equal numbers in 72. In 75. In 80. Always begin with the largest.

RAPID SIGHT WORK.

MULTIPLY:

9	10	12	16	16	16	12	11	15
8	7	6	2	4	5	8	9	4
—	—	—	—	—	—	—	—	—

LESSON CXLII.

What is ⅜ of	What is ⅞ of	What is ⅝ of	What is ¾ of
24	14	24	18
18	28	32	27
30	49	40	36
42	56	56	45
36	63	64	54
48	35	92	63
54	70	96	72

MENTAL QUESTIONS.

1. Leila hemmed 5 aprons for 15c. apiece and was paid in quarters; how many did she receive?

2. Sixteen cakes cut into fourths will make how many pieces?

3. Fourteen quarters of a dollar are how many dollars?

4. When apples are 25c. a peck how many bushels will $8. buy?

5. Fred gathered 5½ bushels of pecans from one tree and 7 pecks from each of the two other trees. How many bushels wree there in all?

6. Two coils of rope each 35 feet in length will make how many jumping-ropes 7 feet long?

7. Fourteen pecks of apples will cost how much at $2. a bushel?

8. Three-and-a-half dozen roses will cost how much at 2cents apiece?

LESSON CXLIII.

Write all the eqnal numbers in 84.   In 96.   In 100.

DIVIDE:

| 11 | 77 | 12 | 60 | 9 | 72 | 12 | 84 |

| 8 | 96 | 25 | 100 | 4 | 80 | 45 | 90 |

| 20 | 80 | 16 | 64 | 2 | 30 | 2 | 50 |

| 36 | 72 | 9 | 63 | 21 | 63 |

. LESSON CXLIII.—Continued.

WHAT IS

$\frac{1}{3}$ of	$\frac{5}{12}$ of	$\frac{7}{12}$ of	$\frac{2}{3}$ of
48	36	24	30
96	48	60	45
84	60	84	60
70	72	96	90

Mental Questions.

1. Maggie sewed two rows of her blocks of patchwork together, 18 in each row. It she had made a square of the blocks how many would have been on a side?

2. Mr. Moore sent me 70 geraniums to plant in a solid square of 8 rows each way; how many more have I than are neeeded?

3. A surface 7in. by 12in. contains how many more square inches than one 9in. square?

4. Walter gets $35 a month and spends $28; what will he save in a year?

5. I gave 9 red roses and 7 white ones to each of five little girls and then had 16 for myself. How many dozen were there at first?

6. When butter is 30c. a pound what must be paid for $2\frac{1}{2}$ pounds?

7. Fannie bought five sheets of gilt-edge paper at 15c. a sheet; what change did she receive from the dollar which she handed to the clerk?

8. What will $1\frac{1}{4}$ pounds of candied fruit cost at 60 cents a pound?

9. Gordon has worked $\frac{2}{3}$ of the year for $12 a month and Andrew 6 months for $14 a month. Which has earned more?

Make a problem $1—3×20c.=?

Make one for (80+16)÷12=?

LESSON CXLIV

REVIEW DRILL.

STUDY SUCH AS YOU DO NOT KNOW.

8×3=24	7×4=28	7×5=35
9×3=27	8×4=32	9×5=45
12×3=36	9×4=36	12×5=60

7×6=42	6×7=42	4×8=32
8×6=48	8×7=56	6×8=48
9×6=54	9×7=63	7×8=56
12×6=72	12×7=84	9×8=72

6×9=54	11×10=110	7×12=84
7×9=63	12×10=120	8×12=96
8×9=72	11×11=121	9×12=108
9×9=81	12×11=132	10×12=120
12×9=108	10×11=110	12×12=144

LESSON CXLV.

THE SQUARES OF NUMBERS.
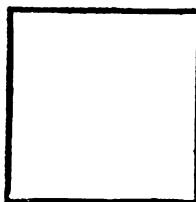
A SQUARE INCH.

How many square inches on the surface of a square that is 1 inch on a side?

How many square inches on the surface of a square that is 2 inches on a side?   Draw it.

How many square inches on the surface of a square that is 3 inches on a side?   On one that is 5 inches on a side? On one that is 6 inches on a side?

How many square inches on the surface of a square that is 4 inches on a side?   On one that is 5 inches on a side?

How many square inches on the surface of a 7-inch square?   An 8-inch square?   A 9-inch square?   A 10-inch square?

If a square measures 11 inches on a side, how many square inches on its surface?

How many square inches on a square surface that measures 12 inches on a side?

$$1^2 = \quad 4^2 = \quad 7^2 = \quad 10^2 =$$
$$2^2 = \quad 5^2 = \quad 8^2 = \quad 11^2 =$$
$$3^2 = \quad 6^2 = \quad 9^2 = \quad 12^2 =$$

LESSON CXLVI.

How long is each side of the square inch? How long is a side of a square that contains 4 square inches? Draw the square.

How long is each side of a square containing 16 square inches?

How long is each side of a square that contains 25 square inches?

We call 2 the *square root* of 4 because $2 \times 2 = 4$, or $2^2 = 4$.

What is the square root of 9? Of 16? Of 25? Of 36?

COPY AND COMPLETE:

The square root of 4 is 2; or, $\sqrt{4} = 2$.

$\sqrt{1} =$ $\sqrt{16} =$ $\sqrt{49} =$ $\sqrt{100} =$

$\sqrt{4} =$ $\sqrt{25} =$ $\sqrt{64} =$ $\sqrt{121} =$

$\sqrt{9} =$ $\sqrt{36} =$ $\sqrt{81} =$ $\sqrt{144} =$

PART II.

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CHAPTER I.

1. NOTATION, NUMERATION, AND ADDITION.
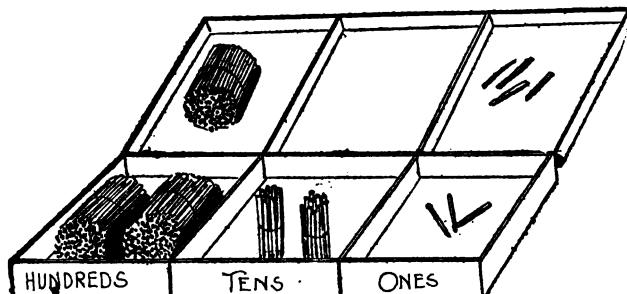
A NUMERATION BOX.

How many single sticks in the first division of the numeration box? How many bundles of ten in the second division? How many bundles of one hundred in the third division? How many sticks in the box? How many on the lid?

If you had 28 sticks, how many bundles of ten could you make and how many single sticks would be left?

If you had twelve bundles of ten sticks, how many bundles could you make for the place of hundreds, and how many would be left for the place of tens?

If you had 3 bundles in the hundreds' place, 7 in the tens' place, and 6 in the ones' place, how many would that be?

How many single sticks will make 8 bundles for the tens' place and leave 7 for the place of ones?

How many bundles of ten will make 8 bundles for the hundreds' place and leave 7 for the place of tens?

How many sticks must you have in order to put 4 bundles in the hundreds' place, 9 in the tens', and 3 sticks in the place of ones?

How many in order to put 5 bundles in the hundreds' place and 6 sticks in the ones' place?

If there are 9 bundles in the hundreds' place and 7 in the tens', how many single sticks?

WRITE IN FIGURES:

One ten and five.	Three hundred, six tens.
Two tens and seven.	Five hundred, nine tens.
Three tens.	Six hundreds, three tens, four ones.
Ten tens.	Four hundred, seven.
Seven tens and eight.	Nine hundred, eighty-two.
Ninety-seven.	Seven hundred, one.

2.   COPY AND LEARN:

Notation is the art of writing numbers.

The Arabic method of notation is one in which numbers are expressed by means of the figures 1, 2, 8, 4, 5, 6, 7, 8, 9, 0.

In the Arabic notation numbers are written according to the Decimal System; that is, ten units of any order are equal to one of the next higher order. Thus, 10 ones are 1 ten, 10 tens are 1 hundred, 10 hundreds are 1 thousand.

Hundreds of Millions.	Tens of Millions.	Millions.	Hundreds of Thousands.	Tens of Thousands.	Thousands.	Hundreds.	Tens.	Ones.

7 ones=7
7 tens=70
3 tens, 6 ones=36
4 hundred=400
3 thousand=3,000
16 thousand=16,000
436 thousand=436,000
4 thousand, 6 hundred, eighty-six=4,686
5 thousand, ninety-seven=5,097
3 thousand, eight=3,008
6 thousand, fourteen=6,014
19 thousand, twenty=19,020
218 thousand, 6 hundred=218,600
1 million, 216 thousand, 785=1,216,785

The reading of numbers is called numeration.

READ THESE NUMBERS:

12	13,090	218,701
614	28,100	705,105
708	35,008	3,162,340
3,126	42,010	15,347,169
16,475	165,475	10,000,230
1,002	300,160	2,015,015

WRITE THESE NUMBERS IN COLUMNS, WITH ONES UNDER ONES,

TENS UNDER TENS, HUNDREDS UNDER HUNDREDS, ETC:

1. 17, 28, 105, 3 thousand, 21 thousand.

2. Two, 15, 630, seven hundred five, six thousand eight hundred ninety-five.

3. Fifty, seven hundred nine, six hundred forty, four thousand two hundred nine, eighty seven.

4. Three hundred, 6 thousand, 7 hundred forty, 14 thousand, 9 hundred sixty-eight, 901.

5. Four thousand, 147 thousand, 16 thousand 8 hundred, 19 thousand twenty-one, 7006.

6. Six thousand, 15 thousand eight, 116 thousand, 38 thousand ten, 3 hundred, 40 thousand, 80.

7. One million 632 thousand 845, 2 million 13 thousand, 7 million 8 hundred, 3 million ten.

8. Four hundred 68, 7 thousand 1, 13 thousand 9, 165 thousand 8, 3 million 19.

3.   WRITTEN ADDITION.
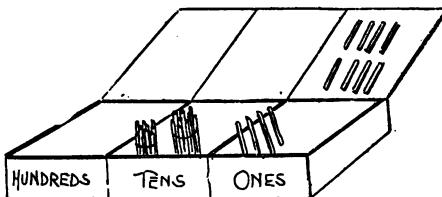
If the sticks on the lid of the box be put with those in-side the box of ones, how many single sticks will there be? If 10 of these be made into a bundle and put into the box of tens, how many single sticks will there be, and how many bundles of ten?

If 7 sticks, 8 sticks and 9 sticks are made into bundles of ten, how many will there be, and how many single sticks will be left?

Suppose there are 36 sticks in the numeration box, and Helen puts in 4 bundles of ten and 8 single sticks; the single sticks will make how many bundles of ten? How many sticks will there be in the box?

Let us show this in figures:

Tens.	Ones.
3	6
4	8
8	4

EXPLANATION:—8 ones and 6 ones are 14, which is 1 ten and 4 ones; write the 4 under the column of ones, and add the 1 ten to the column of tens. 1 ten, 4 tens and 3 tens are 8 tens. The sum of 36 and 48 is 84.

Add 486 and 272.

Hundreds.	Tens.	Ones.
4	8	6
2	7	2
7	5	8

EXPLANATION:—2 ones and 6 ones are 8 ones, 7 tens and 8 tens are 15 tens, which is 1 hundred and 5 tens; write the 5 under the column of tens and add the 1 hundred to the column of hundreds. 1 hundred, 2 hundred, and 4 hundred are 7 hundred. The sum of 486 and 272 is 758.

ADD THESE NUMBERS:

35	46	38	65	18	265
28	56	27	25	29	142

1. Percy counted the freight cars that passed his home the last hour. The first train had 22 freight cars, the second 37, the third 35. How many did he count in all?

2. There are two dozen chairs on the first floor of our house, 19 straight chairs and 5 rockers on the second, and 16 chairs on the third. How many in all?

3. Herbert paid $36 for his bicycle and $48 for his kodak; how much for both?

4. Lewis found 37 shells, and Goodloe 8 more than Lewis; how many did both find?

5. 23+36+28=?

Write a problem for 17+13+28=?

Count by threes up to 90.

4. ADD:

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
33	49	74	18	92	66	72	20
42	53	21	12	27	24	29	70
56	28	9	06	88	41	35	30

9. How many months are 16 mo., 18 mo., 22 mo., and 2 years?

10. How many pecks are 15 pk., 13 pk., 9 pk., and 7 bushels? (4 pk. =1 bu.)

11. How many inches are 13 in., 5 in., 21 in., and 2 feet?

12. How many apples are 28 apples, 86 apples, and 4 dozen apples?

13. How many quarts are 17 qt., 13 qt., 21 qt., and 6 gallons? (4 qt. =1 gal.)

14. How many hours are 18 hr., 19 hr., and 2 days?

15. How many ounces are 18 oz., 23 oz., 17 oz., and 2 pounds? (16 oz.=1 lb.)

16. How many days are 15 days, 24 days, 19 days, and 4 weeks?

17. My milk bill for the month is as follows: The first week 14 qt., the second 9 qt., the third 25 qt., the fourth 6 gallons. How many quarts in all?

18. How many minutes are 23 min., 17 min., 49 min., and 1 hour?

19. How many cents are 29 cents, 18 cents, a quarter of a dollar, and 7 dimes?

20. 48+32+7×8=? Write problem. Count by fours to 100.

5.

1. Add 236 and 327.

2. Add 127, 138, and 7.

3. Add 229, 465, and 13.

4. Add 132, 341, and 419.

5. Add 207, 308, 26 and 15.

ADD:

304	125	324	19	6	215
269	468	592	201	38	39
13	108	157	345	146	3
—	—	—	—	—	—

ADD:

1. Sixteen, three hundred seven, forty.
2. Two hundred, one hundred sixty-five, thirty-eight.
3. Seven, seventeen, seven hundred.
4. Six hundred, one hundred fifty-two, nine.
5. Four hundred one, four hundred forty, fourteen.

ADD:

302	260	140	62	31	74
154	382	390	191	160	391
391	281	360	674	372	162

Count by sixes to 96.

6.

1. On Washington's birthday Miss Kennard's pupils will use 40 small flags, Miss Linton's 38, and each of the two first-grade rooms 44; how many will be needed for all?

2. Jessie has a poultry yard. In March there were 26 chickens hatched; in April 242; in May 78; in June 54. Half of these died; how many lived?

3. One week she sold 3 dozen eggs, the next 5 doz., the next 4½ doz., and the fourth week 3 doz. and 8; how many eggs in all?

4. Phillip had $25 on the first of January; he earned a dollar a week during the year; besides getting $2 as interest. How much money did he have at the end of the year?

5. There are 163 peach trees in an orchard, and 37 more pear trees than peach trees. How many of both kinds?

6. Georgia found 17 large shells, 33 medium size, and 50 small ones. Her aunt gave her a half-cent apiece for them. How much was that for all?

ANSWERS:—(1) 156 flags. (2) 200 chickens. (3) 194 eggs. (4) $79. (5) 363 trees. (6) 50 cents.

7. DRILL IN RAPID ADDITION:

7	9	8	5	4	3	9	7	9
9	3	6	9	8	8	7	9	7
5	2	6	4	3	1	2	6	9
6	7	8	9	8	8	7	9	9
7	4	4	3	2	7	6	5	8
8	6	3	9	8	8	7	9	9
9	5	7	6	6	4	3	4	5
4	8	2	9	8	8	7	9	9
3	9	5	7	3	2	4	3	6
8	7	9	1	8	8	7	9	9

WRITTEN WORK. ADD:

(1)	(2)	(3)	(4)	(5)	(6)
				64	
64	31	12	47	32	97
92	26	34	61	45	27
73	47	56	75	96	84
41	29	87	32	18	91
25	17	98	24	72	26
42	45	28	16	45	33
64	96	39	19	14	44

(7)	(8)	(9)	(10)	(11)	(12)
	39	45	68	40	7
128	126	109	7	70	13
3~5	5	202	50	136	6
129	148	310	279	209	49
278	27	19	306	564	128
109	200	147	128	38	709

Count by sevens to 98. Count by eights to 96. Count by nines to 99.

8.　　ADDITION OF UNITED STATES MONEY.

MENTAL WORK:

If you have 8 copper cents in one pocket and 12 in another how many dimes can you get for all of them?

6 cents, 9 cents and 15 cents are together equal to how many dimes?

How many dimes and cents are equal to 36 cents?

8 dimes and 2 dimes are equal to how many dollars?

12 dimes are how much more than one dollar?

Maggie had 15 dimes in her bank, and this morning her father gave her 10 dimes; what she has now is equal to how many dollars?

WRITTEN WORK.

1. Add 4 dollars 65 cents and 2 dollars 87 cents.

Dollars.	Dimes.	Cents.
4	6	5
2	8	7
7	5	2

EXPLANATION:—7 cents and 5 cents are 12 cents, or 1 dime and 2 cents. Write 2 under the column of cents and add the 1 dime to the column of dimes. 1 dime, 8 dimes and 6 dimes are 15 dimes, or 1 dollar and 5 dimes. Write 5 under the column of dimes and add the 1 dollar to the column of dollars. 1 dollar, 2 dollars and 4 dollars are 7 dollars. Read as the sum 7 dollars and 52 cents.

Or we may write it this way:

$4.65
2.87
———
$7.52

2. Add 2 dollars 40 cents,　　$2.40
　　　5 dollars 10 cents,　　　5.10
　　　1 dollar 6 cents,　　　　1.06
　　　　　　　　　　　　　　———

3. Add 4 dollars 16 cents,　　$4.16
　　　7 dollars,　　　　　　　7.00
　　　1 dollar 9 cents,　　　　1.09
　　　　　　　　　　　　　　———

4. Add 75 cents, $0 75
        38 cents,   .38
        67 cents,   .67
        ─────

    (5)   (6)   (7)   (8)
  $3.12 $2.00 $0.13 $1.50
   4.07   1.07   .75   .75
   1.95   .29   1.85   .49
  ─────   ─────   ─────   ─────

9.   MENTAL   WORK.

1. In Edith's bank there are 11 cents, a nickel, and 4 dimes, how much money is that?

2. How many cents are 20 ¢, 35 ¢, and 40 ¢ ?

3. How many cents are 13 ¢, 27 ¢, and 50 ¢ ?

4. How many dollars are 20 dimes ?

5. How much more than a dollar are 18 dimes ?

6. How much more than 3 dollars are 37 dimes ?

7. How much more than 4 dollars are 45 dimes ?

8. Effie has 85¢ in her bank and 35¢ in her purse; how much more than $1 is that?

9. Clara had 7 dimes in her bank and earned 35 cents by sewing; how much did she have then?

10. What is the sum of 15 cts., 45 cts. and 70 cts?

                    WRITTEN WORK:

1. Edna's dress cost $4.75, the making of it $3.50, her gloves $1.25, and her hat $3. What did she pay for all?

2. Rufus paid $1.60 for a book, $2.25 for a foot-ball, and $6 for having his bicycle repaired; how much did he spend?

3. A lady spent $3.75 the first week of the month, $4.80 the second, $9.46 the third, and $7 the fourth; how much during the month?

4. Add $3.45, $1.65, $8, $9.10.

5. Add $3.05, $1.05, $8, $9.10

6. Add $25.13, $16.29, $14, $2.90.

7. Add 19 cents, 48 cents, 5 dollars 40 cents.

8. Add $3.29, $ .19, $7.35, $20.10.

Ans.:

1. $12.50.   2. $ 9.80.   3. $24.45.   4. $22.20.

5. $29.44..   6. $58.30.   7. $26.07.   8. $30.84.

10. ADD.

(1)	(2)	(3)	(4)
$2.25	4.15	$3.76	$ 3.05
.05	3·20	.18	32.16
1.70	.19	4.10	7.09
3.64	26.00	.08	13.10

(5)	(9)	(7)	(8)
$46.05	$65.18	130.20	$ 67.75
19.33	4.90	150.65	140.92
24.50	.25	240·80	307.18

9. Add 4 dollars 80 cents, 17 dollars 10 cents, 32 dollars, 25 dollars 25 cents, 42 cents.

10. Ellis gave $3.85 for a handsome book, 27 cents for a paper-cutter, and twenty cents apiece for two small picture frames; what did he pay for all?

11. Willie bought a pair of pigeons for 45 cents, 3 fine cochins for $1 apiece, 5 ducks for $4.80, and spent $12.75 for a new poultry house. What did he spend in all?

12. Julian is buying the children's Christmas presents. He pays $1.35 for a doll, 75¢ for her carriage, 40¢ apiece for 2 boxes of blocks, 35¢ for a box of sliced animals, and $2 for a book. How much must he pay for all?

Answers: 9. $79.57.   10. $4.52.   11. $21.   12. $5.25

II. MENTAL WORK.

1. Chester spent 18¢ Monday, 20¢ Tuesday, 30 ¢ Thursday, 35¢ Friday; how much in all?

2. Lizzie got 15¢ apiece for hemming 2 sheets, and 65¢ for making a table-cover; how much for all?

3. How much is 25¢ 35 ¢, and 60¢.?

4. If a straw hat cost 75¢ and the trimmings 50¢, what was the price of both?

5. What will a gallon of strawberries cost at 20¢ a qt.?

6. What must be paid for a quart of cream at 20¢ a pint, and a gallon of milk at 10¢ a quart?

7. What will be the cost of 3 qt. of cherries at 20¢ a quart, and a basket of peaches at 50¢ ?

8. Anna made 4 aprons for 25¢ apiece and a sun-bonnet for 35¢; what did she earn?

9. A boy bought a peck of blackberries for 50 ¢; he sold them at twenty cents a quart; what did he gain?

10. Ruth has earned at different times this week, 15¢, 25¢ 35¢, and $1.25   How much is that in all?

11. In my purse are 3 nickels, 5 dimes, 2 quarters, and a half dollar. How much money is that?

12. I paid 40¢ for a fan, 18¢ for buttons, 30¢ for thread, and 35¢ for edging; how much for all?

13. Harry has 35¢, Willie 25¢ more than Harry, and George 15¢ less than Willie; how much does George have?

· 14. My hyacinths cost 45¢, my lilies 35¢, and violets half as much as the lilies and hyacinths together. What did I pay for the violets? What for all the flowers?

15.   There are 24 pear trees in an orchard, twice that number of apple trees, and one-third as many plum trees as apple trees; how many plum trees?

16. Henry gathered 45 pears yesterday and 35 to-day; how many dozen is that?

CHAPTER II.

I. . SUBTRACTION.

COPY AND COMPLETE:

10—2=	10—3=	10—5	10—7=
20—2=	20—3=	30—5	30—7=
30—2=	40—3=	40—5	10—8=
40—2=	50—3=	60—5	40—8=
50—2==	10—4=	10—6	10—9=
60—2=	20—4=	20—6	50—9=
70—2=	30—4==	70—6	70—9=
90—2=	40—4=	80—6	100—9==

SIGHT WORK.

SUBTRACT:

11	21	11	31	11	21	11	41	11	31
4 .	4	3	3	2	2	5	5	6	6
—	—	—	—	—	—	—	—	—	—

11	41	11	61	11	61	12	32	62	82
7	7	8	8	9	9	3	3	3	3
—	—	—	—	—	—	—	—	—	—

12	32	12	62	72	12	22	12	42
4	4	5	5	5	6	6	7	7
—	—	—	—	—	—	—	—	—

12	62	12	82	13	23	13	33	13	83
8	8	9	9	4	4	5	5	7	7
—	—	—	—	—	—	—	—	—	—

14	24	14	54	15	55	15	95	16	26
8	8	9	9	6	6	7	7	9	9
—	—	—	—	—	—	—	—	—	—

17	37	18	48	20	30	40	50	60	70 ·
8	8	9	9	7	8	6	4	3	8
—	—	—	—	—	—	—	—	—	—

of ones and 2 bundles from the box of tens; how many sticks were left in the numeration box?

Let us show by figures how 28 may be subtracted from 75.

Tens · Ones

$\cancel{7}^6$ 5^{+10} EXPLANATION—8 ones cannot be
2   8   subtracted from 5 ones. We will
———   take 1 ten from the 7 tens and add
4   7   it to the 5 ones, making 15 ones.

Subtracting 8 ones from 15 ones we have 7 ones, and subtracting 2 tens from 6 tens we have 4 tens. Subtracting 28 from 75 we have the remainder 47.

2. From 748 take 275.

$\cancel{7}^6$ 4 $^{+10}8$ Minueud.   EXPLANATION.—Subtracting
2 7 5 Subtrahend. 5 ones from the 8 ones we
———   have 3 ones. 7 tens cannot be
4 7 3 Remainder. subtracted from 4 tens; from
the column of hundreds we will take 1 hundred which is equal to 10 tens and add it to the 4 tens, making 14 tens. Subtracting 7 tens from 14 tens, we have 7 tens; and subtracting 2 hundred from 6 hundred we have 4 hundred. Subtracting 275 from 748 we have the remainder 473.

COPY AND LEARN:

Subtraction is the process of taking one number from another, or of finding the difference between two numbers.

The minuend is the number from which something is subtracted.

The Subtrahend is the number which is subtracted from the Minuend.

The Remainder or Difference is the number found by Subtraction.

If 33 is the Minuend, and 20 the Subtrahend, what is the Remainder?

The Minuend is 96, the Subtrahend 80; find the Remainder.

3.   WRITTEN WORK.

SUBTRACT:

103	105	109	108	129	114
21	21	37	67	38	61

127	132	145	156	164	176
31	90	64	91	84	81

204	209	208	207	206	205
32	46	13	52	71	83

MENTAL WORK.

1. Janet had 45 pears and gave 8 to Charlie and 17 to Roy; how many did she have then?

2. Mary had 60 chickens; sold at one time 32 and at another 18; how many did she have left?

3. Three boys together have 48 melons; 17 are John's; 13 Henry's; how many are Frank's?

4. Four kinds of fowls, 90 in all, are in the yard; there are 13 guineas; 17 turkeys, and 20 ducks; how many chickens?

5. Three children found 80 shells; Helen found 26 and Marie 14; how many did Rachel find?

6. How many more are 4 dozen than 26?

Count off threes from 60 to 3.

4.
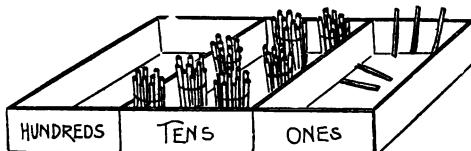
1. There were 75 sticks in the numeration box, and Miss Linton asked George to take out 28. He took one bundle from the box of tens, slipped the rubber off, and put the ten sticks into the box of ones. How many single sticks then in the box of ones? How many bundles in the box of tens? He then took 8 sticks from the box

MENTAL WORK.

1. Rob sold 2 rabbits at 40 cents apiece and with the money bought chickens at 16 cents each. How many did he buy?

2. A lady ordered 350 strawberry plants for 2 beds. If 120 were planted in 1 bed, how many were left for the other?

3. When 165 days are passed, how many days of the year are yet to come?

4. If a merchant shipped 130 barrels of sugar in 1 cargo and 270 in another, how many did he ship in both?

5. A man paid $300 for 2 horses, giving $120 for one of them. What did the other cost?

6. If 260 trees are in an orchard and only 180 bear fruit, how many do not bear?

Count off sixes from 60 to 6.

7.   WRITTEN WORK.

1. My carriage cost me $548 and my horses $390. How much more did I pay for the carriage than for the horses?

2. Frank had 153 rocks in his cabinet and gave each of his 3 cousins 9 of them. How many did he then have?

3. In one pasture a farmer had 92 sheep, in another 235. He sold 182. How many were left?

4. Mr. Berckmann received an order for 25 pear trees, 38 peach trees, 146 apple trees, and 29 mulberry trees. How many in all?

5. Mrs. Lewis bought 6 dozen cans of tomatoes, 20 cans of peaches, and 4 dozen cans of corn. She has used 39 cans. How many are still unopened?

6. From 2 quires of paper 19 sheets have been taken. How many remain?

7. From $1\frac{1}{2}$ quires 27 sheets were taken. How many were left?

8. When 37 weeks of the year are past, how many are yet to come?

9. $372-(48+96)=?$

Write problems for these equations:

$$142+73-96=?$$
$$68c.+25c-48c.=?$$

8. WRITTEN WORK.

SUBTRACT:

365	430	850	960	821
198	219	267	354	397

568	475	381	762	861	265
289	196	296	397	149	188

200	300	700	600	900	700
150	160	525	234	167	265

MENTAL WORK.

1. How much more will 3 dozen apples cost at 20 cents a dozen than a dozen pears at 35 cents?

2. Robert earned 40 cents yesterday and 45 cents to-day. If he buys 7 street-car tickets at 5 cents each, how much of his money will be left?

3. William had 5 dozen ears of pop-corn and gave 16 to Effie. How many did he have then?

4. From a box containing 6 dozen cocoanuts, 18 were sold to one man and 24 to another. How many remained?

5. From a basket containing 160 oranges, 48 were taken at one time and 52 at another. How many remained?

From 84 count off by sevens to 7.

WRITTEN WORK.

SUBTRACT:

430	900	850	290	608
129	299	375	197	239

700	800	900	782	400
168	497	365	197	367

$$680+12+42-165=?$$
$$65+80+162+600-139==?$$
$$4\times200-296=?$$
$$3\times300-452=?$$
$$2\times300-76=?$$
$$86+75+109+237+6-97=?$$
$$600-(182+365)==?$$
$$825-(247+96)=?$$
$$635+186-4\times20=?$$
$$900-(237+663)=?$$

10. COPY AND COMPLETE:

67	96	96	75	162	162
+29	—67	—29	+87	—75	—87

168	305	305	642	821	821
+138	—167	—138	+179	—179	—642

275	443	443	964	777	964
+168	—168	—275	—187	+187	—777

1. The minuend is 742, the subtrahend 127. Find the remainder.

2. The difference between two numbers is 42, and the greater of these two numbers is 96. What is the other number?

3. Harry has 38 marbles, 14 more than John has. How many marbles does John have?

4. There are 140 trees in both of my orchards. In the smaller orchard there are 50 trees. How many in the larger?

5. Eighty-five trees are how many less than 200 trees?

6. One hundred and forty trees are how many more than 89 trees?

7. Three hundred and sixty-five bushels of wheat is how much more than 96 bushels?

8. How much added to $26 will make $200?

11. SUBTRACTION OF FEDERAL MONEY.

MENTAL WORK:

1. How much less than $1 is 80 cents? 70 cents? 60 cents? 40 cents? 30 cents? 20 cents?

2. How much less than $1 is 95 cents? 85 cents? 75 cents? 65 cents? 55 cents? 45 cents? 35 cents? 25 cents? 15 cents? 5 cents?

3. Henry had $1.05 and spent 10 cents. What did he then have?

4. Maud earned $1.20 and spent 25 cents. What did she have then?

5. Grace had $1.25 in her bank and took out $ .50. What was left in the bank?

6. Walter had $1.50 and bought 8 melons at 25 cents apiece. How much did he then have?

7. Little Nellie had 2 in nickels, in her bank, and took out 1 nickel. How much money was left in the bank?

8. If she had taken out 20 cents, how much would have been left?

9. Marion earned .80 last week and $2 this week; how much more did she earn this week than last?

10. Richard has $5 and Henry $1.50; how much more does Richard have than Henry?

11. How much less than $5 is $4.50?

Five dollars less $2.50 is how much? $3.50 and how much will make $5?

12. Willie made $10 last week and spent $1.50; what did he save? If he had saved only $7.50 what must he have spent?

13. How much is $2 less $1.60? How much is $5 less $1.75? $10 less $1.75? $20 less $1.50?

14. James lacks $1.75 of having $20; how much has he?

15. A man had $20 and spent $2.50; how much did he have then?

16. If I buy goods to the amount of $5.50 and hand the salesman $20, what change should he give me?

17. What amount put with $5.50 will make $15?

12.

<div align="center">SIGHT WORK.</div>

Give the result quickly.

$1.25	$1.60	$2.50	$7.50
+75	+40	+50	+2.50

$3.50	$2.50	$7.50	$9.75
+1.50	+2.50	+2.50	+5.25

$2.00	$2.00	$3.00	$5.00
—1.75	—1.80	—1 50	—2.50

<div align="center">MENTAL WORK.</div>

1. How much added to each of the following will make $1?

60c.,   50c.,   25c.,   85c.,   35c.,   58c.,   43c.

2. How much added to each of the following will make $2?

$1.35, $1.75, $1.85,   65c.,   ·35c.,   49c.,   90c.,

3. How much added to each of the following will make $5?

$3.50, $2.50, $1.50, $1.75, $2.25, $3.25, $1.60.

How much added to each of the following will make $10?

$1.50, $2.50, $3.50, $6.50 $7.50, $1.25
$2.25, $3.75. $5.75, $7.40 $6.30

13.

<div align="center">WRITTEN WORK.</div>

SUBTRACT:

$2.00	$15.00	$10.00	$15.00
1.50	1.75	3.75	5.50

$20.00	$25.00	$25.00	$30.00
14.75	6.35	15.95	18.25·

$50 00	$60.00	$48.30	$52.10
4.75	6.35	19.70	37.15

$24.05	$35.05	$96.75	$100.00
18.76	17.28	18.90	4.50

$100.00	$100.00	$100.00	$100.00
35.50	2.95	57.75	5.50

MENTAL WORK.

1. How much is $25. less $5.25? How much must be put with $19.25 to make $25 ?

2. A boy who gets $30 a month, spends $15.75; how much does he save?

3. Ralph has $13.75; how much must he earn to have $20?

4. What is the difference in the price of two coats, one marked $30, and the other $22.50?

5. A boy who earns $25 a month spends $12.50; how much does he save?

6. Alice bought 4 yd. of ribbon at 20 cts. a yard and handed the salesman $5; what change did she receive?

7. Julian had $30, and spent $14.75; what did he have then?

8. What is the difference in the price of two hat-racks, one marked $37, and the other $14.75?

9. How much less than $50 is $29.20?

10. How much less than $50 is $34.75?

Make a problem for $10 less $2 \times \$2\frac{1}{2}$.

14. WRITTEN WORK.

SUBTRACT:

$207.16	$356.07	$470.50	$290.18
198.23	148.65	165.35	138.75

$400	$600	$900	$800	$500
135	175	225	450	137

$46.35	$93.65	$601.10	$400.75
19.00	48.00	107.28	196.25

1. From $600 take $235.
2. From 405 dollars take 17 dollars 10 cents.
3. From $38 take $16.75.
4. From 201 dollars 7 cents, take 85 dollars 28 cents.
5. From $415 take $180.65.

15.   WRITTEN WORK.

1. Nora spent $10 for her hat, gloves, and shoes. The hat cost $4.65, and the gloves $1.60; what was the price of the shoes?

2. Ruth had $9.25 and bought some flannel for $3 90 and muslin for $2.65; what did she have then?

3. How much will Anna have left of $20, after buying a cap for $4.93, gloves for $1.25, a muff for $4, and a dozen handkerchiefs for $2.75?

4. George has $3.73, Earnest has $6.35 more than George, and Edwin as much as the other two boys together; how much has he?

5. Lucius had $45. He paid one bill of $13.65 and another of $19; how much did he then have?

6. Last month William earned $48. He paid $16.75 for board, $6.50 for a coat, and for several small articles $3.65; what did he save?

7. A lady gave $25 for a wardrobe, $12.25 for a bed and $2 apiece for a half dozen chairs; how much less than $50 did she spend?

8. Frank has $10, Walter $3.60 less than Frank, and Richard $8.50 more than Walter; how much have all of the boys together?

9. Martin earned $12.75 and $30, and spent $6.90 and $4.70; how much did he save?

10. $19+$3.62—$17.58= ?

Write problem for 2×$18—$7.60.

MENTAL WORK.

How many quarters of a dollar in $1.25? In $1.50? In $1.75? In $2?

How many half-dollars in $2? In $2.50? In $3? In $3.50? In $5? In $10?

How many 5 cents in $1? In $2?

How many dimes in $1? In $1 10? In $1.20? $In 2? In $3?

In making change for $1.50, if fifty cents is given and the remainder in quarters, how many quarters are given?

In making change for $1, if a quarter and a dime are given and the rest in nickels, how many nickels are given?

In taking $1.60 from $2, what change will be returned?

16. REVIEW.

MENTAL WORK.

Mr. Clarke bought a buggy for $80; after using it a year he sold it, losing one-fourth of the cost price; what did he get for it ?

2. Rosa spent three-quarters of an hour studying her French lesson, an hour and fifteen minutes on her music, and sewed from 10 to 12:30 o'clock. Find the whole time that she was occupied.

3. Fritz can pump 27 gallons of water into the cistern in a quarter of an hour. If two gallons run out in the same length of time, how long will it take him to fill the cistern, which holds 100 gallons?

4. Guy Parr bought me 27 cocoons, and Mary Gerdine 13. Three-fourths of these hatched out beautiful moths. How many moths were there?

5. The baby is 18 months old and Walter is 3 yrs. 6 mos. older. What is Walter's age?

6. From a piece of rope 7$\frac{1}{3}$ yards long a piece 9 ft. long was cut. How many feet remained?

7. For 3$\frac{1}{2}$ bushels of clover seed Lloyd got fifty cents a peck. For how much did he sell them all?

8. Lula went to Rome to stay 9 weeks. A week and five days of the time have passed. How long has she yet to stay?

9. What must Ralph pay for 3 note-books at 15 cents apiece, a Geography at $1.25, and 5 pencils at 2c. apiece? If he hands the clerk $5, what change will he receive?

10. Harry's goat wagon cost him $3.75 and the goats $4.25; he sold the wagon and team for $1.65 less than they cost him; what did he get for them?

11. If the minuend is 260 and the subtrahend 80, what is the remainder?

12. The remainder is 90, the subtrahend 140; what is the minuend?

13. 75 is 45 less than what number?

14. 96 is 45 more than what number?

15. The difference of 2 numbers is 16, and the less is 24; what is the greater?

CHAPTER III.

I. MULTIPLICATION.

1. Multiply 28 by 3.

 28 Multiplicand
  3 Multiplier
 ——
 84 Product

EXPLANATION.—Three times 8 ones are 24. Write the 4 ones under the column of ones, and carry the 2 tens to the next column. Three times 2 tens are 6 tens; 6 tens and 2 tens are 8 tens. The product of 28 and 3 is 84.

QUESTIONS.—What number is repeated 3 times? What is the 28 called? What is the 3 called? What do we call the 84?

Multiplication is the process of repeating a number as many times as is indicated by another number.

The number to be repeated is the Multiplicand.

The number that shows how often the Multiplicand is to be repeated is the Multiplier.

The result of multiplication is called the Product.

The Multiplicand and Multiplier are also called the Factors.

What are the factors of 15? Of 21?

If the multiplicand is 29 and the multiplier 2, what is the product?

If the factors are 9 and 7, what is the product?

What is the product of 11 and 2?

WRITTEN WORK.

MULTIPLY:

35	28	46	79	422	321	142	301
2	2	2	2	2	2	2	2

45	97	70	92	29	86	231	208
3	3	3	3	3	3	3	3

92	75	36	48	165	309	278	208
5	4	4	4	4	4	4	4

MENTAL WORK.

1. Find the cost of 3 oranges at 8c. apiece and a dozen apples at 2c. apiece.

2. What must be paid for 9 bunches of braid at 3c. each, and 15 balls of tape at 2c. a ball ?

3. Find the cost of 12 boxes of hairpins at 4c. a box and 4 papers of needles at 5c. a paper.

4. Find the cost of 9 hat pins at 4c. each, and 10 at 3c. each.

5. Maud carried a dollar to the store and bought 7 bunches of grapes at 5c. a bunch, and 25 figs for 50c. What change did she receive ?

6. What is the sum of 8 threes and 6 fives ?

7. What is the product of 37 and 2 ?

8. What is the product of 3 and 31 ?

9. If the factors are 24 and 4, what is the product ?

10. Eleven packs of fire-crackers at 4c. a pack and 2 sky-rockets at 20c. apiece will cost how much ?

11. One dollar is how much more than 3×16 cents ?

12. One hundred is how much less than 8 fourteens ?

13. Warren had $52 and bought 8 sheep at $4 apiece; how many calves at $5 apiece can he buy with the rest of his money ?

14. From 4 twenties take 3 fifteens.

2.   SLATE WORK.

MULTIPLY :

62	84	73	91	157	205	793	628
5	5	5	5	5	5	5	5

32	48	95	76	306	291	482	794
6	6	6	6	3	6	6	6

Write by sixes from 6 to 116. Count off sixes from 116 to 6.

MENTAL WORK.

Find the cost of these articles :

1. Seven lemons at 5c. apiece and a half-dozen pine-apples at 10c. apiece.

2. Three quarts of cherries at 20 cents a quart, and 6 pints of berries at 5 cents a pint.

3. Eight pounds of brown sugar at 6 cents per pound and 3 pounds of white sugar at 10 cents per pound.

4. Nine hyacinths at 6 cents apiece and 3 dozen roses at $2 a dozen.

5. Six tulips at 6 cents apiece and a dozen lilies at 8 cents each.

6. Four pounds stick candy at 12½ cents per pound and 2 pounds caramels at 20 cents per pound.

7. Twenty apples at the rate of 2 for 5 cents.

8. Two dozen peaches at the rate of 3 for 10 cents.

9. Four yards of ribbon at 6¼ cents per yard.

10. Five dozen buttercups at a half-cent apiece.

11. Seventy-two shells at 15 cents a dozen.

12. Three and one-half pounds of fruit at 16 cents per pound.

3. Write by sevens from 7 to 112. Count off sevens from 112 to 7.

3.   SLATE WORK.

MULTIPLY:

32	45	66	78	910	805	793	408
7	7	7	7	7	7	7	7

96	84	75	316	789	965	478	637
5	6	4	7	4	5	6	7

MENTAL WORK.

1. 13 pears at 7 cents apiece will cost how much less than $1 ?

2. 11 weeks and 3 days are how many days ?

3. 14 weeks are how many days ?

4. A hall 12 feet long and 7 feet wide contains how many more square feet than one that is 9 feet square ?

5. How many more square feet on a surface 12 feet square than on one 15 feet by 7 feet ?

6. 12 sevens are how many more than 9 sixes ?

7. What is the difference between the product of 7 and 13 and the product of 6 and 16 ?

8. What is the difference between the square of 8 and the product of 7 and 14?

4. Write by eights from 8 to 120. Count off eights from 120 to 8.

4.   WRITTEN WORK.

MULTIPLY:

42	36	57	98	214	305	467	608	987
8	8	8	·8	8	8	8	8	8

MENTAL WORK.

Find the cost:

1. A peck of cherries at the rate of 10 cents per quart.

2. Two gallons of tomatoes at the rate of 8 cents per quart.

3. Eight note books at 7 cents each and 9 pencils at 2 cents apiece.

4. 8 pounds candy at 25 cents per pound.

5. 8 pounds candy at $12\frac{1}{2}$ cents per pound.

6. 9 note-books at the rate of 72 cents per dozen.

7. 8 pounds rice, if 3 pounds sell for 24 cents.

8. One quart of okra, at the rate of 96 cents per peck.

9. 7 drawing pencils, if 48 cents will buy 6.

10. 4 picture frames at 20 cents apiece, and 2 brushes at 18 cents each.

11. 3 crochet needles at 15 cents each and a half-pound of wool at 60 cents per pound.

12. A peck of potatoes at the rate of 80 cents per bushel.

5. Write by nines from 9 to 126. Count off nines from 126 to 9.

5.   WRITTEN WORK.

MULTIPLY:

42	36	57	89	108	217	365	2,786
9	9	9	9	9	9	9	9

6.   MENTAL WORK.

1. Find the cost of 4 yards braid at 9 cents per yard, and 9 balls of tape at 3 cents each.

2. How many square feet in a hall 8 feet wide and 3 yards long?

3. How many pencils at 9 cents a dozen can be bought for 81 cents?

4. If cocoanuts are 9 cents apiece how many dozen can be bought for $1.08?

5. What is $\frac{1}{2}$ of $\frac{1}{2}$? $\frac{1}{2}$ of $\frac{1}{4}$? 50 cents is what part of $1? 25 cents is what part of $1? What is $\frac{1}{2}$ of 25 cents? What is $\frac{1}{8}$ of $1?

6. At 12$\frac{1}{2}$ cents apiece how many pineapples will 25 cents buy? 50 cents? 75 cents? $1? $1.25?

7. What will 2 yards ribbon cost at 12$\frac{1}{2}$ cents per yard? 3 yds? 4 yds? 8 yds?

8. How much is 25 cents and 12$\frac{1}{2}$ cents? 50 cents and 12$\frac{1}{2}$ cents? 75 cents and 12$\frac{1}{2}$ cents?

9. What is $\frac{1}{4}$ of $1? $\frac{1}{8}$ of $1? $\frac{3}{8}$ of $1? $\frac{5}{8}$? $\frac{6}{8}$? $\frac{7}{8}$?

10. When sugar is 12$\frac{1}{2}$ cents per pound, how many pounds are sold for $1? For $1.50? For $2?

11. Four pecks of peaches at 50 cts. per peck will buy how may pounds of sugar at 12$\frac{1}{2}$ cts. per pound?

12. What must be paid for 5 yards of muslin at 20 cts. per yard and 6 yards of ribbon at 12$\frac{1}{2}$ cts. per yard?

COPY AND COMPLETE:

$\frac{1}{4}$ of $1=	$\frac{1}{2}$ of 12$\frac{1}{2}$ cts.$=$6$\frac{1}{4}$ cts.
$\frac{1}{2}$ of $\frac{1}{4}$ of $1=	2$\times$6$\frac{1}{4}$ cts.=
$\frac{1}{8}$ of $1==	25 cts.$\div$6$\frac{1}{4}$ cts.=
1\div$12$\frac{1}{2}$ cts.=	$\frac{1}{4}$ of 25 cts.=
12$\frac{1}{2}$ cts. +25cts.=	50 cts.$\div$6$\frac{1}{4}$ cts.=
$\frac{3}{8}$ of $1=	50 cts.$\div$12$\frac{1}{2}$ cts.=
12$\frac{1}{2}$ cts.+50 cts.=	50 cts.$\div$6$\frac{1}{4}$ cts.=
$\frac{1}{2}$ of $1,+$\frac{1}{4}$ of $1=? of $1	75 cts.$\div$12$\frac{1}{2}$ cts.=
$\frac{5}{8}$ of $1= cts.	75 cts.$\div$6$\frac{1}{4}$ cts.=
$\frac{3}{4}$ of $1,+$\frac{1}{8}$ of $1=? of $1	$1 $\div$12$\frac{1}{2}$ cts.=
$\frac{7}{8}$ of $1= cts.	$1 $\div$6$\frac{1}{4}$ cts.=

7.

$10 \times 2 =$?	$10 \times 12 =$?	$100 \times 15 =$?
$10 \times 20 =$?	$10 \times 15 =$?	$100 \times 72 =$?
$10 \times 6 =$?	$100 \times 6 =$?	$10 \times 48 =$?
$10 \times 60 =$?	$100 \ 8 \times =$?	$10 \times 200 =$?

WRITTEN WORK.

1. Multiply 54 by 26.

```
  54        EXPLANATION:
  26            54 multiplied by  6=  324
 ──            54 multiplied by 20= 1080
 324                              ────
 108                      Adding,  1404
 ──
1404
```

2. Multiply 78 by 34.

```
  78        EXPLANATION:
  34            78 multiplied by  4=  312
 ──            78 multiplied by 30= 2340
 212                              ────
 234                              2652
 ──
2652
```

3. Multiply 124 by 326.

```
 124        EXPLANATION:
 326            124 multiplied by 6=    744
 ──            124 multiplied by 20=  2480
 744            124 multiplied by 300=37200
 248                                 ────
 372                                 40424
 ──
40424
```

4. Multiply 65 by 48.

5. Multiply 27 by 32.

6. If there are 34 yards in each of 14 bolts of cloth, how many yards in all?

7. If 24 cows are sold for $32 apiece, what will that be for all of them?

8. There are 26 boxes, each containing 16 bolts of homespun; how many bolts in all?

9. How many sheep in 18 cars, each containing 56 sheep?

10. What must be paid for 14 sets of furniture at $118 per set?

8.   SIGHT WORK.

MULTIPLY:

60	30	40	60	86	36	15
10	10	20	20	10	20	40

18	42	30	14	12	16	72
20	20	30	40	50	60	20

SLATE WORK.

MULTIPLY:

48	57	69	78	96	87	93
30	30	40	50	60	70	80

140	260	320	561	672	832
10	10	20	20	20	40

SIGHT WORK.

MULTIPLY:

6	7	8	18	12	16	17
300	200	200	200	300	400	200

SLATE WORK.

MULTIPLY:

48	65	96	84	73	216	785
300	300	700	700	800	300	400

MENTAL WORK·

1. What will 10 barrels of sugar cost at $16 per barrel?
2. How many children in a school building that contains 20 rooms with 40 children in each?
3. What will 30 acres of land cost at $18 per acre?
4. What will 50 boxes of oranges cost at $10 per box?
5. What will 60 bolts of broadcloth cost at $42 per bolt?
6. A man bought 30 barrels of flour at $6 per barrel and sold it at $8 per barrel; what did he gain?
7. What must be paid for 9 building lots at $300 each?

9.

```
            267
            105
          ─────
1. Multiply 267 by 105.    1335
                          267
          ─────
          28035
```

2. Multiply 135 by 48.   Ans. 6480
3. Multiply 135 by 96.
4. Multiply 482 by 65.   Ans. 31330
5. Multiply 482 by 130.
6. Multiply 975 by 104.   Ans. 101400
7. Multiply 975 by 208.
8. Multiply 368 by 54.   Ans. 19872
9. Find the product of 368 and 108.
10. Find the product of 482 and 354.   Ans. 170628
11. Find the product of 482 and 708.
12. Multiply 608 by 78.   Ans. 47424
13. Multiply 608 by 156.
14. Multiply 4865 by 1004.   Ans. 505960
15. Multiply 4865 by 208.
16. Multiply the sum of 68 and 96 by 304   Ans. 49856
17. Multiply 364 by the product of 9 and 7.
18. (475+182) multiplied by (96—18) is what? Ans. 51246
19. (4×375)+(3×640)= ?
20. (96×82)- (37×45)= ?   Ans. 6207

10.

1. Our school wishes to raise $275 for the library. Three grades have each given $27, the primary class $19, and 2 friends have contributed $35 each. How much is still to be collected?

2. A shepherd had 167 sheep in one field and 364 in another. To each of four men he sold 78 sheep. How many did he then have?   Ans. 219 sheep.

3. The children are to have a concert for the fresh-air fund. Maud has sold 19 tickets, Charlie 28, Ruth 35, Albert and George each 17, and the other children 84. How many tickets have been sold? If they were a half-dollar apiece, how much money should there be?

4. Mr. Merritt sold 25 Jersey calves at $32 each. What did he get for them? With the money he bought a buggy for $75 and a pair of horses for $230. How much did he have then?

5. What would 27 Shetland ponies cost at $68 each?

6. Mr. Burbank bought 9 watches for $216 and sold them at $35 apiece. What did he gain?

7. What is gained by buying 18 bolts of flannel at $475 and selling it at $38 per bolt?   Ans. $209.

8. A housekeeper had $100 for a month's expenses. The rent was $16, servants' wages $11, grocery bills $53, fuel and lights $10. Besides she spent $10 for having some furniture repaired? Did her account balance?

9. My horse cost $95 and my buggy twice that amount. What did I pay for both?

10. My lot cost $570 and my house three times that much. Find entire cost.

11. Mr. Lowe sold 5 bolts of ladies' cloth, each bolt containing 35 yards, at $2 per yard. Find the proceeds.

12. Ten overcoats were bought for $382 and sold for $402. What was the gain? What was the profit on each coat?

13. Mr. Harden bought 12 saddles at $23 apiece and 9 at $21 apiece. Find entire cost.   Ans. $465.

14. A boy earns $78 per month and spends $43. What will he save in a year and a half?   Ans. $630.

15. John has $65, Charlie has 8 times as much as John and Arthur; $85 more than Charlie. How much have all three?

II. REVIEW.

1. Find the sum of 19, 706, 4812, 62300, 7006 and 3126705.

2. The minuend is 7008 and the subtrahend 3675. Find the remainder.

3. The remainder is 785; the subtrahend 960. Find the minuend.

4. The multiplicand is 705, the multiplier 208. Find the product.

5. Find the difference between 3006 and the product of 704 multiplied by 8.

6. What is the difference in price of 167 acres of land at $70 per acre and 216 acres at $107 per acre? ANS. $11422.

7. Multiply the product of 96 and 58 by 37.

8. At the beginning of the year Mr. Wall's stock in trade was $3175, at the close $5000. During the same year Mr. Morris's stock had increased $985. Whose stock has increased more, and how much more?

9. Mr. Wynn sold his house and lot for $4500. How much of this sum was left after he had paid for 21 acres of land at $205 per acre. ANS. $195.

Write a problem for $3800—2×$365 = ?

12.

1. Add $3.75, $1.20, $.09, $4, $.15, $16.82.

2. Add $16, $195, $23.80, $105, $7.91, $2,186.

3. Add $2316, $194.08, $10.01, $3008.16, $1000.

ADD:

(4)	(5)	(6)	(7)
$1.12½	$28.14	$ 4.25	$ 7.06¼
7.87½	37.62½	3.06¼	13.12½
5.25	19.37½	28.06¼	7.50

8. From $16.80 take 97 cents.

9. From $200.27 take $156.09.

10. Subtract $8.25 from $13.

11. Subtract $27.35 from $200.18.

12. From $2016.40 take $10u8.

ANSWERS:

1. $26.01   2. $2538.71   3. $6528.25   8. $15.83
        10. $4¾   11. $172.88   12. $1007.60

MULTIPLY:

$4.25	$16.50	$17.35	$23.19	$.67
4	5	8	8	4

$2.12½	$5.12½	$6.12½	$13.12½	$9.06¼
2	2	4	4	4

13.

1. Lucy bought 8 yards flannel at 75 cents per yard for her winter dress, paid $2 for lining and trimming and $4.50 for having it made. Find the cost of the suit.

2. Helen bought 3 yards ribbon at 60 cents per yard, a hat for $2.35, 2 pairs gloves at $1.35 per pair, and a fan for 65 cents. What did she pay for all?

3. Harriet painted 5 Easter cards, for which she received 65 cents apiece, but the materials for her work cost 95 cents. How much did she gain?

4. What will be the cost of 4 bolts of cloth, each containing 35 yards, at 75 cents per yard?

5. A man pays $7 for a barrel of sugar that contains 125 pounds and sells it at 8 cents a pound. What does he gain?

6. I bought 4 dozen chairs at $3.35 per dozen and gave the merchant a 20-dollar bill. What change did I receive?

7. Ella bought a dress for $13.75, a cloak for $15, and a hat for $5.25. She handed the salesman four 10-dollar bills. What change did she receive?

8. What must be paid for 2 rugs at $9.75 apiece and 40 yards of matting at 50 cents per yard?

9. A farmer's wife sold a grocer 12 hens at 35 cents apiece, 3 ducks at 60 cents apiece, and a pair of turkeys for $2.35. She bought from him sugar to the amount of $2.50. How much money did she receive?

10. What will John receive for hauling and planting 67 shade trees at $1.25 apiece?

11. A man bought 4 acres of land at $35.50 per acre and sold it at $50 per acre. What did he gain?

12. A lady had $250 with which to buy 4 sets of furniture. She paid $42 apiece for 2 bed-room sets and $78.75 for a dining-room set. What was left for the parlor furniture?

13. For 6 months George saved $18.75 per month and Robert $20 per month. How much more did Robert save in this time than George?

14. How much more is 5 times $60 than 3 times $84.25?

15. How much will Harold save in 5 months if he gets $56 per month and spends $28.35?

14.   MENTAL WORK.

1. What must Allen pay for 4 pounds of cherries at 12½ cents per pound and 3 pounds of grapes at 18 cents per pound?

2. George had $6 and bought a tennis racket for $1.60 and a foot-ball for $2.20. What did he have then?

3. How many pounds of sugar at 10 cents per pound will pay for 3 dozen eggs at 15 cents a dozen, a basket of peaches at 40 cents, and a basket of tomatoes at 15 cents?

4. A boy owed $20 and worked 10 days at 75 cents a day in part payment. How much did he owe then?

5. How much more than $20 will 6 tons of coal cost at $4.50 a ton?

6. How much less than $30 will be the cost of 9 cords of wood at $2.50 per cord?

7. What is the difference in the cost of 2 hats at $5.60 apiece and 3 at $4 apiece?

8. Willie and Ellen keep their money in the same toy bank. Willie has put in 3 quarters, a dime, and 4 nickels. Ellen has put in $1.10. How much money now in the bank?

9. How much less than $10 is 4 times 85 cents?

10. How much greater than $20 is five times $7.40?

CHAPTER IV.

1.   DIVISION.

Division is a process of finding how many times one number is contained in another.

The Dividend is the number to be divided.

The Divisor is the number by which we divide.

The Quotient is the number which shows how many times the divisor is contained in the dividend.

MENTAL WORK.

How many 6's in 54? How many 12's in 96? How many 9's in 108?

If the dividend is 84 and the divisor 7, what is the quotient?

What is the quotient of 80 divided by 4?

At $3 apiece how many chairs can be bought for $60?

How many $5 bills should be given in exchange for a hundred-dollar bill.

How many dozen in 120?

How many 4's in 8?   In 80   In 800?

How many 9's in 18?   In 180?   In 1800?

How many 6's in 48?   In 480?   In 4800?

How many 7's in 56?   In 560?   In 5600?

How many 8's in 32?   In 320?   In 3200?

How many 3's in 600?   How many 6's in 1200?

What is the quotient of 360 divided by 6?   Of 7200 by 8?

WRITTEN WORK.

DIVIDE:

3 ⎮ 600	4 ⎮ 800	8 ⎮ 7200	6 ⎮ 240	4 ⎮ 480
5 ⎮ 250	5 ⎮ 355	2 ⎮ 248	4 ⎮ 844	3 ⎮ 696
7 ⎮ 147	7 ⎮ 210	7 ⎮ 217	7 ⎮ 280	7 ⎮ 287
8 ⎮ 320	8 ⎮ 328	8 ⎮ 403	8 ⎮ 728	8 ⎮ 1600

2.   WRITTEN WORK.

DIVIDE:

2	70	2	90	2	56	2	38	2	94	2	114
3	45	3	51	8	78	3	81	3	84	3	102
8	135	3	147	3	165	8	174	3	189	3	192
3	213	3	252	3	281	8	297	3	309	8	312
4	100	4	92	4	108	4	136	4	148	4	156
4	188	4	192	4	228	4	312	4	328	4	336
5	160	5	230	5	265	5	290	5	330	5	385
5	420	5	435	5	460	5	470	5	485	5	495
6	138	6	192	6	234	6	276	6	282	6	324
6	440	6	492	6	504	6	516	6	534	6	588

1. How many pairs of gloves in 36 boxes if there are 6 pairs in each box?

2. How many boxes will it take for 216 pairs of gloves if 6 pairs are put into each?

3. How many panes of glass in 25 windows if there are 6 panes in each?

4. 150 panes of glass are enough for how many windows if there are to be 6 panes in each window?

5. What will be the cost of 2 doz. pears at 4 cents apiece?

6. How many pears at 4c. apiece can be bought for 96c.?

7. How many books in 38 boxes each of which contains a set of 6 volumes?

8 How many boxes will contain 228 books if 6 are put into each box?

9. 24 rows of single desks, 8 in each row, are enough for how many pupils?

10. How many rows of single desks, 8 desks to the row. will be enough for 192 pupils?

3.

DIVIDE:

7 | 154   7 | 182   7 | 203   7 | 224   7 | 231   7 | 245

7 | 301   7 | 315   7 | 329   7 | 336   7 | 364   7 | 378

7 | 469   7 | 490   7 | 525   7 | 595   7 | 602   7 | 651

8 | 184   8 | 200   8 | 216   8 | 232   8 | 264   8 | 296

8 | 304   8 | 312   8 | 352   8 | 424   8 | 504   8 | 520

8 | 536   8 | 600   8 | 656   8 | 688   8 | 704   8 | 752

9 | 198   9 | 207   9 | 216   9 | 243   9 | 252   9 | 306

9 | 351   9 | 387   9 | 405   9 | 423   9 | 432   9 | 468

9 | 504   9 | 522   9 | 585   9 | 603   9 | 675   9 | 693

9 | 702   9 | 756   9 | 792   9 | 801   9 | 855   9 | 891

4.

1. Albert saved $720 in 5 months; how much was that, on an average, for each month?

2. Mr. Jones paid $480 for 5 sets of furniture, what was the average cost?

3. A merchant paid $162 for 9 rugs; what was the average cost?

4. How much must a man save on an average per month to lay up $960 in a year?

5. A man who works 240 hours in 5 weeks, averages how many hours a week? How many a day, counting 6 working days to the week?

DIVIDE:

3 | 7032   3 | 7062   4 | 3812   4 | 6008

5 | 3095   5 | 6125   5 | 7340   5 | 7035

6 | 2136   6 | 4050   6 | 8208   6 | 9178

6 | 10314   6 | 13470   6 | 79006   6 | 20004

5 WRITTEN WORK.

1. Willie sold 3 chickens for 15c. apiece and with the money bought oranges at 5¢ each; how many did he buy?

2. A farmer sold 3 acres of land for $85 an acre, and invested the money in sheep, at $5 a head; how many did he buy?

3. Ralph sold 4 qt. of tomatoes at 18¢ per qt.; how many papers of seed at 3c. per paper can he buy with the money?

4. If a farmer gets $13 apiece for 9 calves, how many pigs at $3 apiece can he buy with the money?

5. A man spent $249 for land at $3 an acre; how many acres did he buy? He afterwards sold it for $9 an acre; what did he get for it?

6. A lady spent 84 cents for bananas worth 3¢ apiece; that was enough to give how many little girls 2 bananas each?

7. A florist has 35 geraniums in each of 4 circles. Suppose he should re-set them in 5 circles, how many plants would there be in each circle?

8. Divide the product of 96 and 5 by 4.

9. Find the quotient of $135 \div 5$, and multiply it by 18.

10. Divide the sum of 96, 87, and 561 by 8

Write a problem for $(75+96+34) \div 5 = ?$

6. MENTAL WORK.

What is $\frac{1}{3}$ of $24? $\frac{1}{2}$ of $62? $\frac{1}{8}$ of $36? $\frac{1}{8}$ of $84?

What is $\frac{1}{4}$ of 480 yd.? $\frac{1}{4}$ of 96 yd.? $\frac{1}{4}$ of 320 yd.?

What is $\frac{1}{8}$ of 60 ft.? $\frac{1}{8}$ of 80 ft.? $\frac{1}{8}$ of 75 apples?

What is $\frac{1}{6}$ of 300 bushels? $\frac{1}{6}$ of 480 gallons?

What is $\frac{1}{10}$ of a minute? $\frac{1}{12}$ of an hour? $\frac{1}{10}$ of 120 minutes? $\frac{1}{10}$ of 2 hours?

If 7 pens cost 63c. what is that for one pen?

If a dozen copy books cost 144 cents, what is that for 1?

If a man's salary is $720 a year, what is that for 1 month?

COMPLETE :

$3 \div 19c. =$	$8 \times 52c. =$	$3 \times 25c. =$
$57c. \div 19c. =$	$200c. \div 25c. =$	$75c \div 25c. =$
$\frac{1}{3}$ of $57c. =$	$\frac{1}{8}$ of $200c. =$	$\frac{1}{3}$ of $75c. =$
6×16 ft.$=$	4×24 yd.$=$	5×15 bu.$=$
96ft.$\div 16$ ft.$=$	96 yd$\div 24$ yd.$=$	75 bu.$\div 15$ bu.$=$
$\frac{1}{6}$ of 96ft.$=$	$\frac{1}{4}$ of 96yd.$=$	$\frac{1}{5}$ of 75 bu.$=$

ANSWER IN WRITTEN EQUATIONS :

1. A man whose wages were $3 per day earned in one year $894; how many days did he work?

2. How many days was he unemployed?

3. How many sq. ft. in a hall 12 ft. wide and 30 ft. long?

4. A certain hall is 9ft. wide and contains 135 sq. ft. How long is it?

5. Marie is making paper flowers. She can get 9 leaves from one sheet of paper. How many sheets will it take to make 7½doz. leaves?

6. How many weeks in 301 days?

7. At 5¢. per yd. how many yards of ribbon can be bought for $2.75?

8. If 9yd. of cashmere cost $7.65, what is that per yd?

9. If 8 bolts of ribbon cost $42.80, what is the cost? per bolt?

10 How many bolts of ribbon worth $7 per bolt can be bought for $203?

Write a problem for $964÷4=?

Write one for ¼ of $964=?

7.   DRILL WORK IN DIVISION.

1. Divide each of the following by 7 :

1374	2686.	19378	24385

2. Divide these by 8 :

26344	25896	43706	75008
43907	31264	67849	59876

3. Divide these by 9 :

73152	67428	34164	156006
43722	86571	41004	60021

Divide these by 10 :

750	630	9760	8320
45900	16307	53780	709065

Divide these by 11:

330	9966	68206	89794
48972	96426	63393	513425

Divide these by 12:

1440	8708	42588	41472
19656	32036	21096	321048

8.

1. Divide the product of 975 and 36 by 9.
2. Take 6 times the quotient of 7265÷5.
3. What is 8 times ¼ of 3796?
4. From the sum of 9825 and 576 take the quotient of 87642÷9
5. Divide the difference of 67005 and 28642 by 7.
6. The factors are 785 and 24; divide their product by 8.
7. The dividend is 45072, the divisor is 12; find the quotient and multiply it by 8.
8. What is ¼ of the product of 972 multiplied by 16?
9. If 9 is one of the factors of 864, what is the other?
10. $(47125 \div 5) + (26937 \div 9) = ?$

ANSWERS: 1. 3900.   2. 8718.   3. 3992.   4. 663. 5. 5480⅓.   6. 2330.   7. 30048.   8. 3888.   9. 96. 10. 12418.

9.   LONG DIVISION.

Complete and learn this table of 13's

2×13=	5×13=	8×13=
3×13=	6×13=	9×13=
4×13=	7×13=	10×13=

1. Divide 273 by 13

By short division.

13 | 273

       21 quotient.

By long division.

13 | 273 (21 quotient.
   26
   —
   13
   13

2. Divide 286 by 13 by short division and by long division.
3. What is the quotient of 351 divided by 13?
4. By long division find out how many 13's are in 4160.
5. What is $\frac{1}{13}$ of 559?
6. If one factor of 702 is 13, what is the other?

10.

Write and learn the table of 14's through 10×14=140. Count rapidly by 14's to 140.

MFNTAL WORK.

How many quarts of milk in 6 jars each containing 8½ gallons?

A man had $100 and bought 14 barrels of flour at $7 per bbl.; how much money had he then?

At $14 apiece how many road-carts can be bought with $126?

How many 14's and what part of 14 in 35? In 49? In 63? In 91?

John earned $13 a week for 8 weeks; Clark $14 a week, for 7 weeks; find the difference in their earnings.

WRITTEN WORK.

DIVIDE:

14 | 294　　14 | 350　　14 | 476　　14 | 732

14 | 896　　14 | 1120　　14 | 1008　　14 | 1260

II.

Write and learn the table of 15's through 10×15=150. Count rapidly by 15's to 150.

MENTAL WORK.

Five dozen are how many fifteens?

Willie bought six dozen apples at fifteen cents per dozen and sold them all for $1.20; what did he gain?

If Letty earns 15 cents a day for 10 days and receives her pay in quarters of a dollar, how many of these will she get?

What will 9 yards of ribbon cost at 15¢ per yd.?

What is $\frac{1}{15}$ of 120?

96 is how much more than six fifteens?

WRITTEN WORK.

Divide each of these numbers by 15.

1. 315	5. 510	90. 690
2. 375	6. 540	10. 1050
3. 405	7. 645	11. 1260
4. 480	8. 675	12. 1440

Write and learn the table of 16's through 10×16=160. Count rapidly by 16's to 160.

SIGHT WORK.

Give the result rapidly:

6×16	70÷16	90—5×16	9×16
100÷16	52÷16	120÷16	160÷16
112÷16	60—3×16	8×16	144÷16

WRITTEN WORK:

Divide each of these numbers by 16.

1.	400	5.	512	9.	736
2.	416	6.	544	10.	1120
3.	208	7.	672	11.	1440
4.	498	8.	688	12.	1600

COMPLETE:

$2\times17=$?	$85\div17=$	$8\times17=$
$3\times17=$	$102\div17=$	$9\times17=$
$4\times17=$	$7\times17=$	$10\times17=$

Divide each number by 17.

1.	204	4.	731	7.	1054	10.	1530
2.	357	5.	850	8.	1258	11.	1547
3.	408	6.	918	9.	1411	12.	1615

13.   WRITTEN WORK:

1. There are 18 men at work in each of 9 rooms. How many in all?

2. How many rugs worth $18 apiece can be bought for $414?

3. Mr. Toomer paid $108 for six sets of furniture, giving the same amount for each. How must he sell each set so as to gain $5 on the cost?

4. If 18 sets of chairs cost $450, what is the average cost?

5. In how many weeks can a man save $576, if he saves $18 per week?

6. How many 18's in 684?

7. What is $\frac{1}{18}$ of 756 bushels?

8. How many acres of land at $18 an acre can be bought for $1008?

9. What is $\frac{1}{18}$ of 360? What is $\frac{5}{18}$ of 360?

10. One factor of 1224 is 18; what is the other?

11. Find the product of 150 multiplied by 5, and take $\frac{1}{18}$ of it.

12. Divide the square of 36 by 18.

14.   RAPID SIGHT-WORK.

How many 20's in each of these numbers?	How many 21's in each?	How many 25's in each?	How many 30's in each?
50	42	40	90
60	63	50	150
70	105	60	120
80	84	80	180
90	126	100	240
120	168	150	210
140	147	175	270

WRITTEN WORK.

1. How many quires of paper in 1,152 sheets?

2. How many watches at $27 apiece can be bought for $675?

3. How many baskets will hold 864 apples if 3 dozen be put into each?

4. A man sells 12 cows at $54 apiece. How many acres of land at $27 an acre can he buy with the money?

5. A clerk gets $70 a month and spends $36; in how many months can he save $816?

6. How much more is $\frac{1}{20}$ of 840 than $\frac{1}{25}$ of 400?

7. Divide the sum of 832 and 368 by 40.

8. What number multiplied by 25 will give 600?

9. What number multiplied by 25 will give 625?

10. What number multiplied by 42 will give 882?

15.   WRITTEN WORK.

1. Divide 2600 by 25.   2. 6496÷32.   3. 9064÷44

$$
\begin{array}{r}
1. \quad 104 \\
25 \overline{)2600} \\
25 \\
\hline
100 \\
100
\end{array}
$$

$$
\begin{array}{r}
2. \quad 203 \\
32 \overline{)6496} \\
64 \\
\hline
96 \\
96
\end{array}
$$

$$
\begin{array}{r}
3. \quad 206 \\
44 \overline{)9064} \\
88 \\
\hline
264 \\
264
\end{array}
$$

4. 2996÷28.   5. 6560÷32.   6. 13770÷45.

FIND THE RESULT:

27×13	$351 \div 13$	$928 \div 32$
29×16	$464 \div 16$	$2304 \div 36$
64×18	$1152 \div 18$	$702 \div 27$
38×17	$646 \div 38$	$1292 \div 34$
203×25	$5075 \div 25$	$10150 \div 50$
107×26	$2782 \div 26$	$5564 \div 52$
75×52	$3900 \div 52$	$7800 \div 104$
58×35	$2030 \div 58$	$4060 \div 27$
109×45	$4905 \div 45$	$14715 \div 15$

16. DRILL-WORK.—FIND THE RESULT.

1.	$13330 \div 62$		11.	$13330 \div 215$
2.	$5451 \div 23$		12.	$5451 \div 237$
3.	$20064 \div 33$		13.	$20064 \div 608$
4.	$8778 \div 42$		14.	$8778 \div 209$
5.	$9936 \div 72$		15.	$9936 \div 138$
6.	$4905 \div 45$		16.	$4905 \div 109$
7.	$8120 \div 35$		17.	$8120 \div 232$
8.	$17518 \div 38$		18.	$17518 \div 401$
9.	$14606 \div 67$		19.	$14000 \div 208$
10.	$30285 \div 45$		20.	$30235 \div 073$

CONTRACTIONS IN DIVISION.

80	6320	20	7896	400	29200	200	67857	150	3150
	79		$394\frac{16}{20}$				$339\frac{57}{200}$		

60	18080	20	2784	500	17500	300	48764	320	7680

70	5250	30	3978	600	10800	400	86792	1500	45000

90	6480	50	4087	700	19600	500	74329	2400	48000

17. PROPERTIES OF NUMBERS.

An *Integer* is a whole number.

A *Factor* of a number is any one of two, or more, integers which, when multiplied together, produce the number.

Give two factors of 10, 15, 21, 49.

Is every *factor* of a number also a *divisor* of that number ?

Name all the divisors of 14, 25, 39 7, 17.

Which of these has no divisor excepting itself and 1 ?

We call such a number a *Prime Number*.

Name all the prime numbers from 1 to 10. From 10 to 20.

Which is the only *even* prime number ?

Write out all the prime numbers under 50 (sixteen). From 50 to 100 (eleven).

All numbers not prime are *Composite*. A composite number is *composed of* other factors than itself and 1.

Name the composite numbers under 10.

Write the composite numbers through 50 (thirty-four).

By what may all even numbers be divided ?

Any number ending in 0 or 5 may be divided by what?

Any number ending in 0 may be divided by what?

Any number may be divided by 3 when the sum of its digits is divisible by 3.

Any number may be divided by 9 when the sum of its digits is divisible by 9.

Any number may be divided by 4 when its last two figures are divisible by 4. Is 4 a factor of 716 ? Of 1880 ? Of 1882 ?

Any number ending in 25, 50, 75, or 00 is divisible by 25.

18.

A *Prime Factor* of a number is a factor which is itself prime. Is 3 a prime factor of 18? Is 9? 12 is the product of what prime factors ?

Name the prime factors of 8, 16, 18, 20, 24, 30.

Write the prime factors of the following:

32	48	72	100	210
39	50	84	105	230
36	57	87	110	576
40	56	90	119	1001
42	60	91	125	1050
45	63	98	144	2015

Name the greatest divisor of 30.

Name a number that will divide 16 and 24. We call such a number a *Common Divisor*.

Name the *greatest* common divisor of 18 and 27. Of 24 and 30. Of 36 and 48.

Name the G. C. D. of the following:

1. 10, 15.   4. 42, 21, 14.   7. 50, 75, 100.
2. 14, 21.   5. 36, 48, 60.   8. 100, 150, 200.
3. 15, 30.   6. 28, 56, 70.   9. 80, 120, 400.

When not readily seen, the Greatest Common Divisor may be found by separating the numbers into their prime factors, and taking the product of such of these prime factors as are common to all the numbers.

Find the G. C. D. of 126 and 168.

Prime Factors found.

2	126		2	168
3	63		2	84
3	21		2	42
	7		3	21
				7

Common Prime Factors multiplied.

$2 \times 3 \times 7 = 42$.   G. C. D.

Find the G. C. D. of the following:

1. 84 and 105.   3. 81 and 135.   5. 324 and 504.
2. 56 and 147.   4. 108 and 180.   6. 168 and 216.

19.

A *Multiple* of a number is the product of that number and some other, thus, 16, 32 and 40 are multiples of 8.

Mention three multiples of 7. How many multiples may a number have?

Mention a number which is a multiple of both 6 and 8. Is 36 a common multiple of 9 and 12?

Name the least number that is a multiple of 3 and 4. Of 5, 5, and 10.

Name the L. C. M. of the following:

1. 2, 3.   4. 2, 8, 6.   7. 10, 15, 20.
2. 4, 6.   5. 3, 4, 6.   8. 15, 20, 30.
3. 5, 15.   6. 6, 9, 12.   9. 24, 36, 72.

WRITTEN WORK.

Find the L. C. M. of 30 and 42.

First Method.   Second Method.

Prime factors of 30=2, 3, 5.
Prime factors of 80=2, 3, 7.
L. C. M. of 30 and 42=$2\times3\times5\times7$=210.
The first three factors, 2, 3, and 5 are
all the prime factors of 30, to which
must be added the 7 because it is a
factor of 42.

$$\begin{array}{r|rr} 2 & 30 & 42 \\ \hline 3 & 15 & 21 \\ \hline & 5 & 7 \end{array}$$

$2\times3\times5\times7$=210

20.

Find the L. C. M. of 30, 70, 84.

$30=2\times3\times5$
$70=2\times5\times7$
$84=2\times2\times3\times7$
2 occurs twice as a factor.
3 occurs once.
5 occurs once.
7 occurs once.
$2\times2\times3\times5\times7$=420, L. C. M.

$$\begin{array}{r|rrr} 2 & 30 & 70 & 84 \\ \hline 3 & 15 & 35 & 42 \\ \hline 5 & 5 & 35 & 14 \\ \hline \cdot 7 & & 7 & 14 \\ \hline & & & 2 \end{array}$$

$2\times3\times5\times7\times2$=420, L.C.M.

Find the L. C. M. of the following:

1. 32, 48.	4. 18, 36, 54.	7. 3, 5, 7, 11.
2. 45, 50,	5. 15, 10, 24.	8. 13, 15, 7.
3. 40, 64,	6. 23, 27, 54.	9. 32, 48, 54.

21.

CANCELLATION.

1. Divide the product of 3, 7, 18, 4, 5, by the product 5, 4, 7, 8. Which factors are common? May they be omitted without affecting the result?

We cross out, or *cancel*, the common factors.

$$\frac{3\times\cancel{7}\times18\times\cancel{4}\times\cancel{5}}{\cancel{5}\times\cancel{4}\times\cancel{7}\times8}=\frac{3\times18}{8}=6\tfrac{6}{8}$$

Divide the product of 3, 18, and 14 by the product of 2, 9, 3.

$$\frac{\cancel{3}\times\cancel{18}^{2}\times\cancel{14}^{7}}{\cancel{2}\times\cancel{9}\times\cancel{3}}=2\times7=14$$

Find the quotients by cancellation:

3. $\dfrac{6\times7\times8}{3\times4\times7}$ 4. $\dfrac{9\times10\times14}{3\times5\times7}$ 5. $\dfrac{2\times6\times15}{3\times5\times2}$

6. $\dfrac{15\times49}{3\times7}$ 7. $\dfrac{18\times27\times30}{9\times10\times6}$ 8. $\dfrac{32\times63\times40}{8\times21\times20}$

9. $\dfrac{35\times40}{7\times5\times80}$ 10. $\dfrac{28\times36}{4\times7\times9\times8}$ 11. $\dfrac{13\times9\times11}{18\times26\times88}$

HOW MANY:

1. Lb. butter @ 15c. will pay for 18 lb. coffee @ 30c.?
2. Doz. eggs @ 10c.   "   "   "   16 gal. syrup @ 50c.?
3. Lb. cotton at 9c.   "   "   "   5 bolts of sheeting, 40 yd. to the bolt @ 18c. per yd?
4. Bales of cotton @ $40 "   "   "   3 tracts of land, each containing 16 acres, @ $120 per acre?
5. Bu. cotton seed @ 30c. "   "   "   28 lb. tea at 60c.?

At what price will

1. 130 lb. lard pay for 200 lb. sugar @ 10c?
2. 280 sheep   "   " 240 bbl. flour @ $7?
3. 200 bu. potatoes "   " 3 sacks coffee, 160 lbs to the sack, @ 40c.?

CHAPTER V.

FRACTIONS.

1. TREATED OBJECTIVELY:

1.
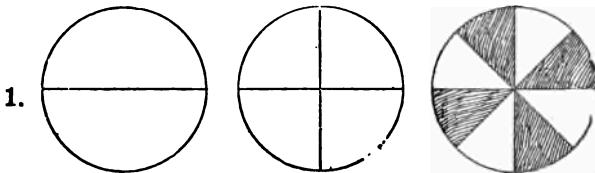
COPY AND COMPLETE. LOOK AT THE CIRCLES AS YOU DO THIS:

$$1=\frac{}{2}\qquad \frac{1}{2}=\frac{}{4}\qquad \frac{3}{8}=\frac{}{2}\qquad \frac{2}{4}=\frac{}{8}$$
$$1=\frac{}{4}\qquad \frac{1}{2}=\frac{}{8}\qquad \frac{7}{8}=\frac{}{4}\qquad \frac{3}{4}=\frac{}{8}$$
$$1=\frac{}{8}\qquad \frac{2}{4}=\frac{}{2}\qquad \frac{1}{4}=\frac{}{8}\qquad \frac{6}{8}=\frac{}{4}$$

$$\frac{3}{4}=1\qquad 2=\frac{}{4}\qquad 1=\frac{8}{8}\qquad \frac{4}{2}=$$
$$\frac{4}{2}=\qquad 3=\frac{}{4}\qquad 2=\frac{}{8}\qquad \frac{16}{8}=$$
$$\frac{6}{2}=\qquad 4=\frac{}{4}\qquad 2\frac{1}{4}=\qquad \frac{20}{4}=$$

$$\frac{1}{2}+\frac{1}{4}=\qquad \frac{1}{2}+\frac{4}{8}=\qquad 1-\frac{1}{4}=\qquad \frac{3}{8}-\frac{1}{4}=$$
$$\frac{1}{2}+\frac{1}{4}+\frac{1}{4}=\quad \frac{1}{4}+\frac{1}{8}=\qquad \frac{1}{2}-\frac{1}{4}=\qquad \frac{5}{8}-\frac{1}{2}=$$
$$\frac{1}{2}+\frac{1}{8}=\qquad \frac{1}{2}+\frac{1}{4}+\frac{1}{8}=\quad \frac{1}{2}-\frac{1}{8}=\qquad \frac{7}{8}-\frac{3}{4}=$$

ADD:

$$\begin{array}{ccccc}
2\frac{1}{4} & 3\frac{1}{2} & 5\frac{1}{8} & 6\frac{3}{8} & 7\frac{1}{8} \\
2\frac{1}{4} & 6\frac{1}{4} & 2\frac{1}{4} & 9\frac{1}{2} & 4\frac{3}{4} \\
\hline
\end{array}$$

SUBTRACT:

$$\begin{array}{ccccc}
10\frac{1}{2} & 12\frac{3}{4} & 9\frac{7}{8} & 7\frac{3}{8} & 10\frac{3}{4} \\
3\frac{1}{4} & 6\frac{1}{2} & 2\frac{1}{2} & 2\frac{1}{4} & 2\frac{1}{8} \\
\hline
\end{array}$$

MULTIPLY:

$$\begin{array}{ccccc}
2\frac{1}{2} & 3\frac{1}{2} & 6\frac{1}{4} & 5\frac{1}{4} & 8\frac{1}{4} \\
2 & 4 & 4 & 3 & 3 \\
\hline
\end{array}$$

COMPLETE:

$\frac{1}{2}$ of 1= $\frac{1}{2}$ of $\frac{2}{4}$= $\frac{1}{4}$ of 1=

$\frac{1}{2}$ of $\frac{1}{2}$= $\frac{1}{2}$ of $\frac{2}{2}$= $\frac{2}{4}$ of 1=

$\frac{1}{2}$ of $\frac{1}{4}$= $\frac{1}{2}$ of $\frac{6}{8}$= $\frac{7}{8}$ of 1=

$1 \div \frac{1}{2}=2$ $2 \div \frac{1}{2}=$ $1 \div \frac{1}{8}=$

(One separated into halves equals two halves.)

$1 \div \frac{1}{4}=$ $3 \div \frac{1}{2}=$ $2 \div \frac{1}{8}=$

$1 \div \frac{1}{8}=$ $2 \div \frac{1}{4}=$ $1\frac{1}{2} \div \frac{1}{8}=$

2.   MENTAL WORK.

Twelve quarters of a dollar and 6 half-dollars are how many dollars?

How many dollars in 17 quarters of a dollar?

$3\frac{1}{4}$ are how many quarters?

How many pounds of butter at $\frac{1}{4}$ of a dollar per pound can be bought for $2\frac{1}{4}$?

What is $\frac{1}{2}$ of $10\frac{1}{2}$ yards of ribbon?

What is $\frac{1}{2}$ of $12\frac{1}{2}$ cents?

What is $\frac{1}{4}$ of $\frac{1}{2}$?

What is $\frac{1}{4}$ of $12\frac{1}{2}$?

If a piece of muslin $28\frac{1}{2}$ yards long be cut into 4 equal pieces, what will be the length of each piece?

If it takes $\frac{1}{2}$ pound of butter for a cake, $5\frac{1}{2}$ pounds are enough for how many cakes?

How many quarters of a dollar must be given as change for $7\frac{1}{2}$?

If $1\frac{1}{4}$ yards is cut from a piece of ribbon $5\frac{1}{2}$ yards long, how much will be left?

How much is $5\frac{1}{2}$ less $2\frac{1}{4}$?

3.
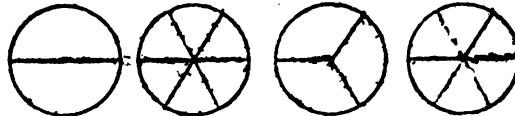
Halves compared with sixths.   Thirds compared with sixths.

COPY AND COMPLETE:

$1=\frac{}{2}$ $\frac{1}{2}=\frac{}{6}$ $\frac{3}{6}=\frac{}{2}$ $2=\frac{}{6}$

$1=\frac{}{3}$ $\frac{1}{3}=\frac{}{6}$ $\frac{4}{6}=\frac{}{3}$ $2=\frac{}{3}$

$1=\frac{}{6}$ $\frac{2}{3}=\frac{}{6}$ $2=\frac{}{3}$ $3=\frac{}{6}$

$\frac{1}{2} + \frac{1}{8} =$ $\frac{2}{3} + \frac{2}{3} =$ $\frac{5}{6} - \frac{1}{2} =$

$\frac{1}{2} + \frac{1}{3} =$ $\frac{1}{2} - \frac{1}{4} =$ $\frac{5}{6} - \frac{1}{8} =$

$\frac{1}{3} + \frac{1}{6} =$ $\frac{1}{2} - \frac{5}{6} =$ $\frac{5}{6} - \frac{2}{3} =$

$1 \div \frac{1}{2} =$ $2 \div \frac{1}{2} =$ $\frac{1}{2}$ of $\frac{1}{3} =$

$1 \div \frac{1}{3} =$ $2 \div \frac{1}{3} =$ $\frac{1}{3}$ of $1 =$

$1 \div \frac{1}{6} =$ $2 \div \frac{1}{6} =$ $\frac{1}{6}$ of $1 =$

$\frac{6}{3} =$ $2\frac{1}{2} =$ $\frac{12}{6} =$ $1 - \frac{1}{8} =$

$\frac{9}{3} =$ $3\frac{1}{3} =$ $2\frac{1}{6} =$ $2 - \frac{1}{3} =$

$\frac{10}{3} =$ $\frac{12}{3} =$ $\frac{18}{6} =$ $4 - \frac{1}{6} =$

ADD:

$4\frac{1}{2}$	$12\frac{1}{3}$	$7\frac{1}{6}$	$5\frac{1}{4}$
$5\frac{1}{6}$	3	$2\frac{5}{6}$	$2\frac{1}{3}$
7	$4\frac{2}{3}$	5	$7\frac{2}{3}$
—	—	—	—

SUBTRACT:

$12\frac{5}{6}$	$10\frac{1}{3}$	7	$9\frac{4}{5}$
$8\frac{1}{2}$	$5\frac{1}{6}$	$2\frac{1}{6}$	$3\frac{3}{4}$
—	—	—	—

MULTIPLY:

$8\frac{1}{2}$	$13\frac{1}{3}$	$4\frac{2}{3}$	$8\frac{1}{6}$
4	2	2	7
—	—	—	—

MENTAL WORK.

When ribbon is $\frac{1}{3}$ of a dollar per yard, how many yards will $2 buy?

What will 6 pounds cheese cost at $16\frac{2}{3}$ cents per pound?

What will 3 pounds coffee cost at $33\frac{1}{3}$ cents per pound?

If four melons are cut into thirds and 2 into sixths, how many pieces will there be in all?

If $\frac{1}{3}$ of a melon be cut into 3 equal pieces, what part of a melon will each piece be?

From a bag of candy weighing 7 pounds, $2\frac{1}{4}$ pounds was taken; how much was left?

How much is $4\frac{1}{2}$ less $2\frac{1}{3}$?

How many pounds of butter in 6 pails each containing $2\frac{1}{2}$ pounds?

4
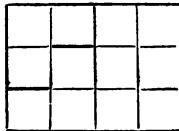
How many squares in this rectangle? One square is what part of it? Three squares? Four squares? Six squares? How many groups of 2 squares do you see? Two squares are what part of the rectangle?

COPY AND COMPLETE:

$1 = \frac{}{2}$	$\frac{1}{4} = \frac{}{12}$	$\frac{6}{12} = \frac{}{2}$	$1 \div \frac{1}{2} =$
$1 = \frac{}{8}$	$\frac{2}{4} = \frac{}{12}$	$\frac{8}{12} = \frac{}{3}$	$1 \div \frac{1}{3} =$
$1 = \frac{}{4}$	$\frac{3}{4} = \frac{}{12}$	$\frac{12}{12} = \frac{}{8}$	$1 \div \frac{1}{4} =$
$1 = \frac{}{3}$	$\frac{4}{4} = \frac{}{12}$	$\frac{1}{2}$ of $\frac{1}{6} =$	$1 \div \frac{1}{6} =$
$1 = \frac{}{12}$	$\frac{1}{6} = \frac{}{12}$	$\frac{1}{2}$ of $\frac{1}{3} =$	$1 - \frac{1}{3} =$
$\frac{1}{2} = \frac{}{12}$	$\frac{3}{6} = \frac{}{12}$	$\frac{1}{2}$ of $\frac{6}{12} =$	$1 - \frac{1}{6} =$
$\frac{1}{3} = \frac{}{12}$	$\frac{6}{6} = \frac{}{12}$	$\frac{1}{2}$ of $\frac{6}{8} =$	$1 - \frac{6}{8} =$
			$2 - \frac{6}{8} =$

ADD:

$2\frac{1}{2}$	$7\frac{1}{12}$	$8\frac{6}{8}$	$4\frac{1}{12}$	$5\frac{1}{8}$
$3\frac{6}{8}$	$2\frac{1}{2}$	$2\frac{1}{12}$	$3\frac{1}{4}$	$5\frac{1}{12}$

SUBTRACT:

$10\frac{5}{12}$	$9\frac{4}{8}$	$10\frac{7}{12}$	$8\frac{4}{12}$	11
$3\frac{1}{8}$	$1\frac{1}{8}$	$3\frac{1}{8}$	$3\frac{1}{4}$	$8\frac{1}{12}$

MULTIPLY:

$5\frac{6}{8}$	$8\frac{1}{8}$	$5\frac{1}{12}$	$3\frac{1}{12}$	$2\frac{1}{12}$
6	3	6	12	12

MENTAL WORK.

Julia drew a circle and painted one-half of it red and one-third blue. How much was left white?

Kate painted one-half of a circle blue and one-twelfth of it yellow. How much was left unpainted?

One-third of a circle is how many times as large as one-twelfth of it?

How many more twelfths in one-half than in one-fourth?

Charlie cut his birthday cake into 12 equal pieces. One-third of it was eaten at dinner and 5 pieces at tea. What part of it remained?

How much more is five-sixths than nine-twelfths?

5.
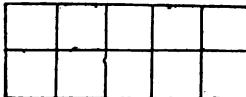
How many times larger is $\frac{1}{2}$ of this rectangle than $\frac{1}{10}$ of it? Than $\frac{5}{10}$?

How many times larger is $\frac{3}{10}$ than $\frac{1}{10}$ of it? $\frac{6}{10}$ than $\frac{1}{10}$? $\frac{7}{10}$ than $\frac{1}{10}$?

How much larger is $\frac{1}{2}$ than $\frac{1}{10}$? $\frac{3}{5}$ than $\frac{4}{10}$? $\frac{3}{5}$ than $\frac{1}{10}$?

How many tenths in $\frac{3}{5}$? In $\frac{4}{5}$?

If I erase $\frac{1}{10}$, what part of the rectangle will remain? If $\frac{1}{5}$ is taken away, how many tenths will remain?

How many tenths in 2 rectangles? In 3?

COMPLETE:

$\frac{1}{2}=\frac{}{10}$	$\frac{1}{2}$ of $\frac{6}{10}=$	$\frac{1}{2}+\frac{1}{2}=$	$\frac{1}{2}-\frac{1}{5}=\frac{}{10}$
$\frac{1}{2}-\frac{}{10}=$	$\frac{1}{2}+\frac{1}{10}=$	$\frac{1}{2}+\frac{3}{5}=\frac{}{10}$	$2\times\frac{5}{10}=$
$\frac{1}{2}$ of $\frac{1}{5}=$	$\frac{1}{2}+\frac{3}{10}=$	$\frac{3}{5}+\frac{}{10}=1$	$2-1\frac{1}{10}=$

ADD:

$4\frac{1}{3}$	$3\frac{1}{2}$	$8\frac{3}{5}$	$4\frac{1}{2}$	$7\frac{1}{2}$
$7\frac{1}{10}$	$6\frac{1}{10}$	$2\frac{1}{5}$	$7\frac{3}{10}$	$6\frac{1}{10}$

SUBTRACT:

$8\frac{1}{2}$	$9\frac{1}{2}$	$16\frac{3}{5}$	$17\frac{4}{5}$	$13\frac{1}{2}$
$3\frac{1}{10}$	$6\frac{1}{5}$	$8\frac{1}{10}$	$2\frac{3}{10}$	$7\frac{3}{10}$

MULTIPLY:

$8\frac{1}{4}$	$9\frac{2}{3}$	$6\frac{1}{5}$	$3\frac{2}{5}$	$9\frac{1}{10}$
4	3	7	5	7

MENTAL WORK.

What is $\frac{1}{2}$ of $6\frac{1}{2}$? $\frac{1}{2}$ of $8\frac{2}{3}$? $\frac{1}{2}$ of $12\frac{4}{5}$?

What is $\frac{1}{2}$ of $8\frac{4}{10}$? $\frac{1}{3}$ of $6\frac{9}{10}$? $\frac{1}{4}$ of $12\frac{1}{2}$?

If $\frac{1}{8}$ of my money is \$8, what is all of it?   What is $\frac{1}{4}$ of it?

If $\frac{1}{7}$ of a rectangular surface is 9 inches, what is all of it? What is $\frac{2}{3}$ of it?

If $\frac{1}{8}$ of a plot of ground is 20 square feet, what is all of it?   What is $\frac{3}{4}$ of it?

Sixteen is $\frac{1}{4}$ of what number?   12 is $\frac{1}{8}$ of what number?

If $\frac{2}{3}$ of my money is \$18, what is $\frac{1}{3}$ of it?   What is all of it?

6.   II.

A *Fraction* is one or more of the equal parts of a unit or whole; as, $\frac{1}{3}$ of an orange, $\frac{1}{7}$ of a week, etc.

The *Denominator* of the fraction shows into how many equal parts the unit is separated.   The word *Denominator* means that which names.

The *Numerator* of the fraction shows how many of the equal parts are taken.   The word *Numerator* means that which numbers.

In the Fraction $\frac{5}{8}$ of a yard, 8 is the Denominator and 5 the Numerator.   What does the 8 show?   What does the 5 show?

A Proper Fraction is one whose numerator is less than its denominator, as $\frac{2}{3}$, $\frac{7}{10}$.

Is the value of a proper fraction less or more than 1?

An Improper Fraction is one whose numerator is greater than its denominator, or equal to it, as $\frac{7}{5}$, $\frac{8}{5}$, $\frac{4}{4}$.

Is the value of an improper fraction less than 1?

A Mixed Number is composed of a whole number and a fraction, as $5\frac{1}{2}$.

Similar Fractions have a common denominator, as $\frac{5}{13}$, $\frac{3}{13}$, $\frac{7}{13}$.

Equivalent Fractions are equal in value, as $\frac{1}{2}$ and $\frac{2}{4}$.

Mention two fractions equivalent to $\frac{6}{13}$.

Will it change the value of a fraction to multiply its numerator and its denominator by the same number?

Will it change the value of a fraction to divide its numerator and its denominator by the same number?

To reduce a fraction is to change its form without changing its value.

7.   REDUCTION.

A.   TO REDUCE A FRACTION TO ITS LOWEST TERMS:

A fraction is in its *Lowest Terms* when its value is expressed in the smallest possible numbers. Thus, $\frac{5}{10}$ of a dollar is expressed in lowest terms as $\frac{1}{2}$ of a dollar; $\frac{2}{3}$ of a yard as $\frac{1}{3}$ of a yard.

1. Reduce $\frac{4}{8}$ to its lowest terms.

What number will divide both numerator and denominator without a remainder? If both be divided by 4, will the value of the fraction be changed? How will the form of the fraction be changed?

Reduce each of the following fractions to its lowest terms:

$$\frac{9}{12} \qquad \frac{3}{18} \qquad \frac{4}{20} \qquad \frac{21}{28} \qquad \frac{24}{36} \qquad \frac{28}{40} \qquad \frac{125}{150}$$

$$\frac{4}{10} \qquad \frac{6}{18} \qquad \frac{5}{20} \qquad \frac{22}{28} \qquad \frac{48}{64} \qquad \frac{9}{48} \qquad \frac{84}{357}$$

$$\frac{6}{15} \qquad \frac{9}{18} \qquad \frac{16}{20} \qquad \frac{27}{36} \qquad \frac{11}{34} \qquad \frac{25}{200} \qquad \frac{96}{288}$$

8.

B.   TO REDUCE A FRACTION TO HIGHER TERMS.

Reduce $\frac{2}{5}$ to 20ths.

By what must the denominator be multiplied to bring it to 20ths? If the numerator also be multiplied by this number, will the value of the fraction be changed?

REDUCE:

$\frac{2}{5}$ to 20ths	$\frac{4}{11}$ to 44ths	$\frac{5}{18}$ to 144ths
$\frac{7}{8}$ to 40ths	$\frac{5}{12}$ to 96ths	$\frac{3}{100}$ to 500ths
$\frac{7}{10}$ to 50ths	$\frac{7}{15}$ to 75ths	$\frac{3}{125}$ to 500ths
$\frac{9}{15}$ to 30ths	$\frac{7}{30}$ to 90ths	$\frac{7}{56}$ to 224ths

SIGHT WORK.

Name the value of each in 24ths:

$\frac{1}{3}$ $\frac{2}{3}$ $\frac{3}{4}$ $\frac{5}{8}$ $\frac{1}{4}$ $\frac{7}{8}$ $\frac{5}{12}$ $\frac{11}{12}$ 1 2

Name the value of each in 36ths:

$\frac{1}{3}$ $\frac{3}{4}$ $\frac{5}{8}$ $\frac{3}{4}$ $\frac{7}{12}$ $\frac{3}{18}$ $\frac{7}{18}$ 1 2

Name the value of each in 64ths:

$\frac{1}{4}$ $\frac{1}{4}$ $\frac{3}{8}$ $\frac{5}{16}$ $\frac{7}{32}$ 1 2

Name the value of each in 144ths:

$\frac{1}{3}$ $\frac{1}{6}$ $\frac{7}{8}$ $\frac{1}{12}$ $\frac{1}{4}$ $\frac{1}{18}$ $\frac{3}{36}$ $\frac{7}{12}$ $\frac{3}{8}$ $\frac{7}{12}$ $\frac{5}{8}$ $\frac{7}{18}$ 1 2

Name the value of each in 500ths:

$\frac{1}{4}$ $\frac{1}{4}$ $\frac{1}{5}$ $\frac{3}{10}$ $\frac{7}{25}$ $\frac{3}{50}$ $\frac{1}{100}$ $\frac{3}{250}$ $\frac{3}{50}$ $\frac{15}{100}$ 1 2

9.

C. TO REDUCE AN IMPROPER FRACTION TO A WHOLE OR A MIXED

NUMBER.

$\frac{4}{4}$ is equal to what whole number? $\frac{7}{5}$ is equal to what mixed number?

Reduce the following to whole, or to mixed numbers:

$\frac{8}{2}$	$\frac{10}{5}$	$\frac{24}{8}$	$\frac{100}{10}$	$\frac{1000}{10}$
$\frac{10}{5}$	$\frac{15}{7}$	$\frac{72}{8}$	$\frac{100}{3}$	$\frac{1000}{8}$
$\frac{33}{13}$	$\frac{22}{9}$	$\frac{70}{16}$	$\frac{100}{16}$	$\frac{636}{25}$
$\frac{64}{8}$	$\frac{102}{7}$	$\frac{80}{25}$	$\frac{100}{8}$	$\frac{400}{15}$

10.

D. TO REDUCE A MIXED NUMBER TO AN IMPROPER FRACTION.

Reduce $5\frac{2}{7}$ to 7ths. How many 7ths in 5? How many 7ths in 5 and $\frac{2}{7}$?

Reduce the following to improper fractions:

$7\frac{1}{4}$	$18\frac{3}{4}$	$11\frac{7}{8}$	$164\frac{1}{2}$	$14\frac{3}{25}$
$3\frac{1}{10}$	$16\frac{1}{2}$	$12\frac{3}{10}$	$37\frac{3}{10}$	$32\frac{1}{20}$
$9\frac{1}{4}$	$20\frac{1}{4}$	$14\frac{3}{8}$	$24\frac{1}{13}$	$164\frac{7}{15}$

Reduce each of the following to a fraction having 20 for its denominator:

$\frac{1}{4}$ $\frac{4}{5}$ $\frac{13}{10}$ $\frac{88}{25}$ 2 8 5 $\frac{3}{2}$ $2\frac{1}{4}$ $\frac{7}{10}$ $3\frac{1}{10}$ $1\frac{1}{8}$

11.   ADDITION OF COMMON FRACTIONS.

To be added, fractions must be similar; that is, they must have a common denominator.

Add $\frac{1}{3}$ $\frac{2}{5}$ and $\frac{1}{6}$.

$$\frac{1}{3}=\frac{10}{30}$$
$$\frac{2}{5}=\frac{12}{30}$$
$$\frac{1}{6}=\frac{5}{30}$$
$$\overline{}$$
$$\frac{27}{30}=\frac{9}{10}$$

We see that the least common multiple of the denominators, 3, 5 and 6, is 30; we therefore reduce each fraction to 30ths; and find their sum to be $\frac{27}{30}$, which reduced to its lowest terms is $\frac{9}{10}$.

ADD:

1. $\frac{1}{2}$ $\frac{1}{4}$ $\frac{1}{8}$ 6. $\frac{4}{7}$ $\frac{3}{14}$ $\frac{9}{28}$ 11. $\frac{3}{8}$ $\frac{5}{16}$ $\frac{1}{64}$

2. $\frac{1}{8}$ $\frac{1}{3}$ 7. $\frac{7}{8}$ $\frac{3}{16}$ $\frac{1}{48}$ 12. $\frac{3}{8}$ $\frac{1}{9}$ $\frac{3}{144}$

3. $\frac{1}{8}$ $\frac{1}{10}$ $\frac{1}{20}$ 8. $\frac{5}{9}$ $\frac{3}{15}$ $\frac{1}{45}$ 13. $\frac{5}{14}$ $\frac{7}{12}$ $\frac{1}{84}$

4. $\frac{7}{30}$ $\frac{9}{20}$ $\frac{13}{30}$ 9. $\frac{7}{15}$ $\frac{9}{30}$ $\frac{8}{60}$ 14. $\frac{5}{16}$ $\frac{7}{12}$ $\frac{9}{48}$

5. $\frac{3}{16}$ $\frac{5}{16}$ $\frac{7}{12}$ 10. $\frac{3}{25}$ $\frac{7}{50}$ $\frac{3}{100}$ 15. $\frac{11}{16}$ $\frac{2}{3}$ $\frac{1}{80}$

	(1)	(2)	(3)	(4)	(5)
	$2\frac{1}{2}$	$7\frac{1}{4}$	$8\frac{1}{4}$	$7\frac{1}{3}$	$6\frac{1}{4}$
	$8\frac{1}{4}$	$2\frac{1}{16}$	7	$2\frac{1}{4}$	$3\frac{1}{3}$
	$5\frac{2}{4}$	$8\frac{1}{16}$	$5\frac{1}{16}$	5	$8\frac{1}{2}$
	6	$4\frac{2}{3}$	$3\frac{1}{4}$	$8\frac{2}{3}$	$7\frac{2}{4}$

12.   RAPID SIGHT WORK.

Reduce to thirds and add:

$$\frac{2}{3}+\frac{1}{3} \qquad \frac{2}{3}+\frac{2}{9} \qquad \frac{6}{12}+\frac{2}{3} \qquad \frac{12}{18}+\frac{1}{3}+\frac{2}{9}$$

Reduce to halves and add:

$$\frac{4}{8}+\frac{3}{8} \qquad \frac{1}{2}+\frac{5}{10} \qquad \frac{3}{8}+\frac{1}{2}+\frac{5}{10}$$

Reduce to fourths and add:

$$\frac{1}{2}+\frac{1}{4} \qquad \frac{2}{8}+\frac{3}{4} \qquad \frac{4}{16}+\frac{1}{4} \qquad \frac{7}{8}+\frac{1}{4}+\frac{1}{2}$$

Reduce to 10ths and add:

$$\frac{1}{2}+\frac{7}{10} \qquad \frac{8}{20}+\frac{1}{10} \qquad \frac{1}{2}+\frac{3}{10}+\frac{6}{30}$$

PROBLEMS.

1. There are $5\frac{1}{4}$ acres in one tract of land, $7\frac{1}{4}$ in another, and 15 in another; how many in all?

2. There are $3\frac{1}{4}$ pounds of sugar in one bag and twice that quantity in another; how many pounds in both?

3. What is the boundary of a rectangle 8 inches long and $3\frac{1}{4}$ inches wide?

4. How many feet around the edge of a rectangle $3\frac{1}{4}$ feet wide and $7\frac{3}{8}$ feet long?

5. Mr. Gray paid $\$3\frac{1}{4}$ for wood, $\$7\frac{1}{2}$ for flour, $\$14\frac{3}{4}$ for sugar, and $\$27\frac{1}{10}$ for meat; how much for all?

13.   SUBTRACTION OF FRACTIONS.

SIGHT WORK.

Give the result in the simplest form of the fraction.

$\frac{13}{20}-\frac{9}{20}$	$\frac{17}{36}-\frac{8}{36}$	$\frac{3}{4}-\frac{1}{2}$	$6-1\frac{1}{2}$
$\frac{13}{25}-\frac{3}{25}$	$\frac{11}{30}-\frac{5}{30}$	$\frac{6}{8}-\frac{1}{4}$	$5-2\frac{1}{2}$
$\frac{9}{16}-\frac{7}{16}$	$\frac{17}{30}-\frac{3}{30}$	$\frac{3}{4}-\frac{1}{8}$	$10-2\frac{3}{4}$

WRITTEN WORK.

(Reduce fractions to a common denominator before subtracting.)

1. From $\frac{11}{20}$ take $\frac{1}{4}$. $\frac{11}{20}-\frac{1}{4}=\frac{11}{20}-\frac{5}{20}=\frac{6}{20}=\frac{3}{10}$

2. $\frac{17}{20}-\frac{1}{5}$	7. $\frac{3}{4}-\frac{1}{16}$	12. $\$\frac{3}{4}-\$\frac{1}{10}$
3. $\frac{13}{25}-\frac{1}{5}$	8. $\frac{7}{8}-\frac{5}{24}$	13. $\frac{3}{4}$ yd.$-\frac{1}{2}$ yd.
4. $\frac{19}{20}-\frac{3}{8}$	9. $\frac{11}{12}-\frac{5}{30}$	14. $\frac{9}{10}$ A.$-\frac{7}{15}$ A.
5. $\frac{23}{25}-\frac{3}{10}$	10. $\frac{7}{8}-\frac{11}{12}$	15. $\frac{5}{8}$ mo.$-\frac{1}{2}$ mo.
6. $\frac{4}{5}-\frac{1}{3}$	11. $\frac{11}{12}-\frac{4}{7}$	16. $\frac{5}{7}$ yr.$-\frac{1}{4}$ yr.

(Subtract without reducing to improper fractions.)

1. $12\frac{1}{8}$	3. $30\frac{4}{5}$	5. $19\frac{1}{8}$	7. $42\frac{7}{8}$
$-6\frac{1}{2}$	$-7\frac{3}{25}$	$-3\frac{1}{4}$	$-15\frac{1}{7}$
2. $15\frac{7}{8}$	4. $16\frac{7}{10}$	6. $11\frac{1}{2}$	8. $75\frac{1}{8}$
$-4\frac{1}{4}$	$-3\frac{1}{2}$	$-5\frac{1}{4}$	$-16\frac{3}{10}$

9. $42\frac{11}{20}$	11. 32	13. $10\frac{1}{4}$	15. $10\frac{1}{4}$
$-16\frac{3}{10}$	$-7\frac{1}{13}$	$-1\frac{1}{2}$	$-2\frac{1}{8}$

10. $56\frac{11}{20}$	12. 26	14. $12\frac{1}{2}$	16. $7\frac{4}{5}$
$-13\frac{5}{18}$	$-3\frac{1}{2}$	$-6\frac{2}{3}$	$-3\frac{9}{10}$

17. $3\frac{1}{2}+5\frac{1}{2}-6\frac{1}{3}=?$ 19. $13\frac{1}{4}+7\frac{3}{4}-9\frac{4}{5}=?$

18. $19\frac{1}{4}+3\frac{1}{8}-14\frac{7}{8}=?$ 20. $12\frac{7}{35}+3\frac{1}{8}-10\frac{1}{7}=?$

14.   MULTIPLICATION OF FRACTIONS.

MENTAL WORK.

Janet has $\frac{1}{4}$ of a dollar and Louise 6 times a much; how much does Louise have?

Robert has drawn one circle $\frac{3}{4}$ of an inch in diameter and another whose diameter is 8 times as great; what is the diameter of the second circle?

How many melons will it take for 20 boys if each has $\frac{1}{4}$ of a melon?

There is $\frac{1}{8}$ of a pound of candy in one box and 12 times that much in another; how many pounds is that?

The width of a certain rectangle is $\frac{2}{8}$ of a yard, and its length 9 times as much; how long is it?

If one side of a square is $\frac{2}{8}$ of a yard, what is its boundary?

WRITTEN WORK.

Multiply each of the following by 7, and reduce to whole or mixed numbers:

$$\frac{3}{8} \quad \frac{4}{8} \quad \frac{3}{14} \quad \frac{9}{10} \quad \frac{1}{8} \quad \frac{3}{8} \quad \frac{19}{13} \quad \frac{7}{8} \quad \frac{4}{8} \quad \frac{5}{18}$$

Multiply by 4 and reduce the fractions to their simplest form:

$$\frac{7}{12} \quad \frac{1}{8} \quad \frac{1}{8} \quad \frac{3}{11} \quad \frac{3}{20} \quad \frac{7}{30} \quad \frac{5}{33} \quad \frac{3}{33} \quad \frac{7}{58} \quad \frac{15}{66}$$

Multiply by 6:

$$\frac{1}{8} \quad \frac{4}{8} \quad \frac{3}{8} \quad \frac{7}{24} \quad \frac{1}{8} \quad \frac{1}{15} \quad \frac{7}{30} \quad \frac{3}{17} \quad \frac{1}{8} \quad \frac{4}{8}$$

15.

Does increasing the numerator increase the value of the fraction? What effect has decreasing the denominator?

Multiply the numerator of $\frac{3}{4}$ by 2. Divide the denominator of $\frac{3}{4}$ by 2. Did you double the value of the fraction in each case?

Double the value of $\frac{4}{8}$ in two ways.

Increase the value of $\frac{1}{7}$ three-fold. In what two ways can it be done?

In what two ways may we take 4 times $\frac{5}{8}$?

Multiply $\frac{3}{20}$ by 5 in two ways.

Multiply each of these by 5:

$$\frac{1}{5} \quad \frac{3}{8} \quad \frac{1}{10} \quad \frac{3}{20} \quad \frac{4}{30} \quad \frac{7}{40} \quad \frac{3}{45} \quad \frac{7}{50} \quad \frac{1}{30} \quad \frac{4}{78}$$

MULTIPLY:

$$\begin{array}{ccccccc} 8\frac{1}{2} & 6\frac{1}{3} & 8\frac{2}{3} & 6\frac{4}{5} & 7\frac{1}{8} & 9\frac{4}{7} & 12\frac{3}{8} \\ 4 & 3 & 9 & 5 & 8 & 7 & 8 \end{array}$$

$$\begin{array}{cccccc} 195\frac{1}{2} & 317\frac{9}{10} & 89\frac{7}{13} & 45\frac{7}{15} & 68\frac{3}{20} & 28\frac{3}{10} \\ 8 & 7 & 6 & 8 & 15 & 20 \end{array}$$

16.   PARTITION OF FRACTIONS.

If $\frac{1}{2}$ of a melon be cut into 3 equal parts, what part of the whole melon will each piece be?

If a quarter-circle be divided into fifths, what part of a whole circle will each fifth be?

George drew a rectangle and divided it into fourths. He then divided each fourth into 8 equal parts. Into how many parts was the whole rectangle divided? What part of the rectangle were 7 of these parts?

A certain plot of ground contains $\frac{2}{3}$ of an acre; what part of an acre is $\frac{1}{2}$ of this plot?

If $\frac{3}{4}$ of a gallon of milk be poured into 3 cups, putting the same quantity into each, what part of a gallon will there be in each cup?

What is

$$\frac{1}{2} \text{ of } \frac{1}{2} \qquad \frac{1}{2} \text{ of } \frac{3}{4} \qquad \frac{1}{8} \text{ of } \frac{1}{2} \qquad \frac{1}{4} \text{ of } \frac{1}{2} \qquad \frac{1}{2} \text{ of } \frac{1}{4}$$

What is

½ of ¼	⅓ of ⅞	¼ of ⅓	⅓ of ⅗	⅙ of ⅑
½ of ⅓	⅓ of 1/16	⅓ of ¼	¼ of 1/7	⅛ of ⅞
½ of ⅗	⅓ of 3/16	⅓ of ⅛	¼ of ⅔	⅛ of ¼

½ of ⅞	⅛ of ⅞	¼ of ⅚	⅓ of 1⅛	⅐ of 8½
½ of ⅝	⅛ of 13/14	¼ of 1⅘	⅛ of 5⅜	⅕ of 2⅞
½ of 1/10	⅛ of 15/17	¼ of 2⅘	⅛ of 2¼	⅙ of 1¼

⅔ of ½	⅖ of ⅕	¾ of ⅐	⅗ of ⅚	¾ of 1⅘
⅛ of ½	¼ of ⅕	⅓ of ¼	⅝ of 6/11	⅜ of 1⅚
⅜ of ¼	¾ of ⅓	⅜ of ⅝	⅚ of 6/11	⁴⁄₉ of 1⅓

17.

The sign of multiplication is sometimes substituted for the word *of* in examples like the above; and the work performed by multiplying the numerators together for a new numerator and the denominators for a new denominator. In doing this, the factors that are common to both numerator and denominator should be cancelled.

WRITTEN WORK :

Take ½ of each.

16½	20⅘	72¾	What is ½ of 37⅜?
20¼	88 6/11	96⅜	2)37⅜) The remainder, 1⅜
32⅜	44 11/14	84⅞	18 11/16) = 11/8, and ½ of 11/8 is 11/16

Take ⅛ of each.

15⅕	30⅘	72⅔	16⅓	32⅘	32¼
24⅜	52 8/11	81⅘	22⅛	37 3/10	156⅛
27⅕	51 11/13	96 7/10	25¼	26⅔	236⅘

What is ¾ of 17⅕?

4 | 17⅕ (¼ of 17⅕ is 4 3/10 | 17⅕ | The result will be
4 3/10) ¾ of 17⅕ is 3 times | 3 | the same if we first
3 (as much, or 12 9/10 | 4 | 51⅗ | multiply 17⅕ by 3
————— | 12 9/10 | and then take ¼ of
12 9/10 | | the product

What is

¾ of 27⅘	⁴⁄₇ of 14 7/11	3/10 of 260 11/13
⅝ of 16¼	⅜ of 24 11/17	7/10 of 16⅛

18.   DIVISION OF FRACTIONS.

TO DIVIDE A WHOLE NUMBER BY A FRACTION.

How many half-dollars in \$3? $3 \div \frac{1}{2} = ?$

How many thirds of an acre in 7 acres? $7 \div \frac{1}{3} = ?$

A 2-inch line divided into thirds of an inch, gives how many thirds? $2 \div \frac{1}{3} = ?$

A 2-inch line divided into parts $\frac{2}{3}$ of an inch long, gives how many parts? $2 \div \frac{2}{3} = ?$

Draw a line 4 inches long, divide it into thirds of an inch. Draw another line 4 inches long, divide it into two-thirds of an inch.

Which gives you more parts? Which gives you longer parts?

If a band 8 feet long be cut into pieces $\frac{1}{7}$ of a foot long, how many will there be? If each piece had been $\frac{2}{7}$ of a foot long, how many would there have been?

If a ribbon 10 yards long be cut into strips $\frac{2}{3}$ yard long, how many strips will there be?

If a wire 9 yards long be cut into pieces $\frac{3}{4}$ yard long, how many pieces will there be?

At $\$\frac{1}{4}$ per pound, how many pounds of coffee can be bought for \$8?

At $\$\frac{2}{3}$ per pound, how many pounds will \$8 buy?

GIVE PROBLEMS FOR THESE:

$$6 \div \frac{1}{4} = ? \qquad 5 \div \frac{1}{2} = ?$$
$$6 \div \frac{3}{4} = ? \qquad 4 \div \frac{2}{3} = ?$$

SIGHT-WORK.

$1 \div \frac{1}{2}$	$8 \div \frac{1}{4}$	$2 \div \frac{2}{3}$	$4 \div \frac{1}{10}$
$4 \div \frac{1}{2}$	$8 \div \frac{3}{4}$	$6 \div \frac{1}{3}$	$4 \div \frac{8}{10}$
$5 \div \frac{1}{3}$	$9 \div \frac{1}{4}$	$6 \div \frac{2}{3}$	$20 \div \frac{1}{2}$
$6 \div \frac{1}{4}$	$9 \div \frac{3}{4}$	$3 \div \frac{1}{7}$	$20 \div \frac{1}{4}$
$7 \div \frac{1}{8}$	$2 \div \frac{1}{5}$	$3 \div \frac{3}{7}$	$20 \div \frac{1}{8}$

19.   WRITTEN WORK.

1. How many $\frac{2}{7}$ in 6?

$\left\{\begin{array}{l} 1 \div \frac{1}{7} = 7 \text{ (sevenths)} \\ 6 \div \frac{1}{7} = 42 \text{ (sevenths)} \\ 6 \div \frac{2}{7} = 21 \text{ (sevenths)} \\ \text{The result will be the} \\ \text{same if we multiply the} \\ \text{whole number by the} \\ \text{denominator of the} \\ \text{fraction and divide the} \\ \text{product by the numer-} \\ \text{ator.} \end{array}\right.$

2. ANALYSIS.—In 1 there are 7 sevenths. In 6 there are 6 times as many—that is, 42 sevenths. If there are 42 one-sevenths in 6, there will be only one-half as many two-sevenths—that is, 21.

3. How many one-eighths in 9? How many $\frac{2}{8}$ in 9?

4. How many $\frac{4}{7}$ in 15?

5. What is the quotient of 9 divided by $\frac{3}{8}$?

6. How many $\frac{2}{7}$ yd. in 14 yd.?

7. How many $\frac{2}{8}$ lb. in 16 lb.?

8. If a plot of ground containing 21 acres be laid off in $\frac{3}{4}$-acre lots, how many will there be ?

9. At $\$\frac{2}{7}$ per lb., how many lb. tea can be bought for $28?

10. If 75 lb. butter is made into rolls containing $\frac{3}{4}$ lb. each, how many rolls will there be?

20.   TO DIVIDE A MIXED NUMBER BY A FRACTION.

MENTAL WORK:

At $1 per yard, how many yards of cloth can be bought for $2½? At $\$\frac{1}{4}$ per yard, how many times that many yards can be bought? $2\frac{1}{2} \div \frac{1}{4} = ?$

At $1 per pound, how many pounds of coffee can be bought for $5½? At $\$\frac{1}{8}$ per pound, how many pounds? $5\frac{1}{2} \div \frac{1}{8} = ?$

At $1 per yard, how much ribbon can be bought for $7½? At $\$\frac{1}{4}$ per yard, how much? At $\$\frac{3}{4}$ per yard, how much? $7\frac{1}{2} \div \frac{1}{4} = ?$ $7\frac{1}{2} \div \frac{3}{4} = ?$

WRITTEN WORK.

1. Divide $3\frac{1}{4}$ by $\frac{1}{4}$.

ANALYSIS.

$3\frac{1}{4} \div 1 = 3\frac{1}{4}$

$3\frac{1}{4} \div \frac{1}{4} = 4$ times as much, or $12\frac{3}{4}$

2. Divide $2\frac{1}{4}$ by $\frac{2}{3}$.

ANALYSIS.

$2\frac{1}{4} \div 1 = 2\frac{1}{4}$

$2\frac{1}{4} \div \frac{1}{3} = 3$ times as much, or $6\frac{3}{4}$

$2\frac{1}{4} \div \frac{2}{3} = \frac{1}{2}$ as much, or $3\frac{3}{8}$

> The result is the same if we multiply the dividend, $3\frac{1}{4}$, by the denominator of the fraction, and divide the product by the numerator.
>
> The result is the same if we multiply the dividend, $2\frac{1}{4}$, by the denominator of the fraction, and divide the product by the numerator.

3.	$3\frac{1}{4} \div \frac{1}{4}$	7.	$6\frac{1}{4} \div \frac{1}{3}$	11.	$15\frac{1}{4} \div \frac{1}{4}$
4.	$3\frac{1}{2} \div \frac{3}{4}$	8.	$6\frac{1}{4} \div \frac{4}{5}$	12.	$15\frac{1}{4} \div \frac{3}{4}$
5.	$7\frac{1}{4} \div \frac{1}{2}$	9.	$10\frac{1}{4} \div \frac{1}{6}$	13.	$9\frac{1}{8} \div \frac{3}{4}$
6.	$7\frac{1}{2} \div \frac{2}{3}$	10.	$10\frac{1}{2} \div \frac{5}{6}$	14.	$12\frac{1}{4} \div \frac{5}{6}$

21. TO DIVIDE A FRACTION BY A FRACTION.

MENTAL WORK:

If a half-circle be separated into fourths of a circle, how many will there be? $\frac{1}{2} \div \frac{1}{4} = ?$

If a half-circle be separated into eighths of a circle, how many will there be? $\frac{1}{2} \div \frac{1}{8} = ?$

If a third of an acre of land be separated into sixths of an acre, how many will there be? $\frac{1}{3} \div \frac{1}{6} = ?$

How many 12ths in $\frac{1}{2}$? $\frac{1}{2} \div \frac{1}{12}$?

How many 9ths in $\frac{1}{3}$? $\frac{1}{3} \div \frac{1}{9} = ?$

How many 10ths in $\frac{1}{2}$? $\frac{1}{2} \div \frac{1}{10} = ?$

WRITTEN WORK.

1. Divide $\frac{1}{2}$ by $\frac{2}{5}$.

ANALYSIS.

$\frac{1}{2} \div \frac{1}{5} = 2\frac{1}{2}$ (fifths,

$\frac{1}{2} \div \frac{2}{5} = \frac{1}{2}$ as much, or $1\frac{1}{4}$ (fifths)

> The result is the same if we multiply the dividend, $\frac{1}{2}$, by the denominator of the fraction, and divide the product by the numerator.

2. Divide $\frac{1}{2}$ by $\frac{5}{8}$.   4. Divide $\frac{1}{4}$ by $\frac{2}{3}$.

4. Divide $\frac{1}{4}$ by $\frac{3}{7}$.   5. Divide $\frac{1}{4}$ by $\frac{1}{7}$.

6. Divide $\frac{3}{4}$ by $\frac{5}{7}$.

ANALYSIS.

$1 \div \frac{1}{7} = 7.$

$\frac{1}{4} \div \frac{1}{7} = \frac{1}{4}$ as much, or $\frac{7}{4}$.

$\frac{3}{4} \div \frac{1}{7} = 3$ times as much, or $\frac{21}{4}$.

$\frac{3}{4} \div \frac{5}{7} = \frac{1}{5}$ as much, or $\frac{21}{20}$.

Since the numerator of the dividend is really multiplied by the denominator of the divisor, and the result divided by the numerator—for convenience the terms of the divisor may be transposed, and the two fractions multiplied. Thus: $\frac{3}{4} \div \frac{5}{7} = \frac{3}{4} \times \frac{7}{5} = \frac{21}{20}$.

DIVIDE:

$\frac{5}{8}$ by $\frac{2}{7}$. $\frac{9}{10}$ by $\frac{3}{5}$.

$\frac{4}{7}$ by $\frac{3}{10}$. $1\frac{1}{2}$ by $\frac{3}{5}$.

Second method.

1. Divide $\frac{3}{4}$ by $\frac{3}{20}$. $\frac{3}{4} = \frac{15}{20}$. $\frac{15}{20} \div \frac{3}{20} = 5$.

2. Divide $\frac{5}{8}$ by $\frac{3}{10}$.

Reducing to a common denominator, we have $\frac{25}{40} \div \frac{12}{40}$ $= \frac{25}{12}$, or $2\frac{1}{12}$.

3. Divide $\frac{5}{7}$ by $\frac{3}{8}$.

4. Divide $\frac{5}{7}$ by $\frac{6}{15}$.

5. Divide $1\frac{8}{9}$ by $\frac{2}{3}$.

6. Divide $\frac{17}{20}$ by $\frac{3}{10}$.

7. How often is $\$\frac{3}{7}$ contained in $\$\frac{9}{10}$? At $\$\frac{3}{7}$ per yard, how many yards of muslin can be bought for $\$\frac{9}{10}$?

8. At $\$\frac{3}{8}$ per pound, what part of a pound of coffee can be bought for $\$\frac{1}{4}$?

8. How many times is $\frac{3}{7}$ contained in $1\frac{5}{8}$?

9. What is the quotient of $\frac{7}{8} \div \frac{1}{4}$?

Write a problem for $\frac{9}{10} \div \frac{3}{5} = ?$

22. D. TO DIVIDE A MIXED NUMBER BY A FRACTION.

1. How many times is $\frac{2}{3}$ contained in $7\frac{1}{4}$?

ANALYSIS.

$7\frac{1}{4} \div 1 = 7\frac{1}{4}$

$7\frac{1}{4} \div \frac{1}{3} = 3$ times $7\frac{1}{4}$, or $21\frac{3}{4}$

$7\frac{1}{4} \div \frac{2}{3} = \frac{1}{2}$ as much, or $10\frac{7}{8}$

{ By what part of the divisor is $7\frac{1}{4}$ multiplied? By what part divided? What, then, is a short way of dividing a mixed number by a fraction?

2.	$9\frac{1}{2} \div \frac{1}{4}$	5.	$3\frac{1}{2} \div \frac{2}{3}$	8.	$7\frac{1}{4} \div 1\frac{1}{2}$ $(7\frac{1}{4} \div \frac{3}{2})$
3.	$6\frac{1}{8} \div \frac{1}{3}$	6.	$4\frac{1}{2} \div \frac{4}{5}$	9.	$2\frac{1}{4} \div 1\frac{1}{8}$
4.	$7\frac{1}{8} \div \frac{1}{2}$	7.	$6\frac{1}{4} \div \frac{3}{7}$	10.	$10\frac{2}{3} \div 1\frac{1}{4}$

If both dividend and divisor are mixed numbers, each may be reduced to an improper fraction, and the division done as in C.

1. Divide $6\frac{1}{4}$ by $3\frac{1}{8}$. $\frac{25}{4} \div \frac{25}{8} = ?$

2. At $1\frac{1}{4}$ per yard, how many yards of silk can be bought for $12\frac{1}{2}$?

3. How many sashes, each $2\frac{1}{2}$ yards long, can be cut from a bolt containing $22\frac{1}{2}$ yards?

4. A certain rectangle containing $31\frac{1}{2}$ square yards is $4\frac{1}{2}$ yards in width. How long is it?

5. A man's wages are $1\frac{3}{4}$ per day and he has earned $28. How many days has he worked?

If $\frac{5}{8}$ of a pound of candy is put up in each box, how many boxes will it take for $12\frac{1}{2}$ pounds?

23.   REVIEW WORK IN COMMON FRACTIONS.

1. Reduce to a common denominator $\frac{1}{2}$, $\frac{3}{7}$, $2\frac{1}{4}$, $\frac{7}{12}$.

2. What is the sum of $\frac{1}{5}$, $\frac{3}{4}$, $\frac{1}{2}$ of $\frac{1}{5}$, and $\frac{5}{12}$?

3. By how much is $18\frac{3}{10}$ greater than $5\frac{1}{15}$?

4. From $12\frac{1}{4}$ take $6\frac{7}{8}$.

5. From the sum of $2\frac{1}{5}$ and $3\frac{7}{10}$ take $1\frac{7}{20}$.

6. Arthur has $18½ and Marion ¼ as much. How much does Marion have?

7. Leslie has $7¼ and Nora five times as much. How much does Nora have?

8. Julian saved $5¼ last month and 7 times that much the month previous. How much in all?

9. My cloak cost $18½, my hat ¼ of that amount, and my dress as much as my cloak and hat. What did I pay for my dress?

10. What is the sum of ¾ of ⅔ and ⅞ of ⅝?

11. What will 5½ yards of silk cost at $¾ per yard?

12. If 9¼ and 4¼ are the factors, what is the product?

13. What will ⅞ of a yard of velvet cost at $⅔ per yard?

14. How many times is ⅔ contained in 1⅘?

15. What is the quotient of �ₜ²₀ divided by ¾?

16. How many times is ⅝ contained in 12½?

17. How many times is 4½ contained in 22½?

18. 12½÷2⅛=?

19. At the rate of $5¼ per week, how long will it take to earn $58¾?

20. From the product of 6½ and 3¼, take the quotient of 10⅞ divided by ⅜.

ANSWERS:

1. ⁴²⁄₈₄, ³²⁄₈₄, ¹⁸⁹⁄₈₄, ⁴²⁄₈₄.   11. $4⅛.

3. 13⁷⁄₃₀.   13. $⁷⁄₁₃ (How many cents?)

5. 4¹¹⁄₂₀.   15.. 1¼.

7. $36¼.   17. 5 times.

9. $23⅛.   19. 11 weeks, 1 day.

CHAPTER VI.

DECIMAL FRACTIONS.
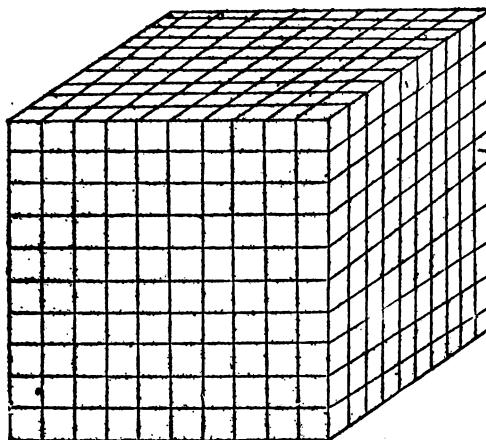
1.

This prism is made of blocks that are inch cubes. How many faces has the prism? How many edges? How long is each edge? Is the prism a cube? Why?

How many layers of blocks in the cube? How many blocks in each layer? In 3 layers? 7 layers? 9 layers?

One layer of blocks is what part of the cube? 3 layers? 7? 9? If 1 layer be taken away what part of the cube will be left?

If I take out the front row of blocks from the top layer, what part of that layer will be taken?

How many rows of ten blocks in each layer? In 2 layers? In the entire cube? One row of 10 blocks is what part of the cube?

Take out one corner block. What part of a layer is gone? What part of the cube?

Seven blocks are what part of the cube? Nine? Eleven?

What part of 10 is 1? Is 3? Is 7? is 9?

What part of 100 is 1? Is 3? Is 7? Is 9? Is 17?

What part of 1000 is 1? Is 3? Is 7? Is 9? Is 37?

What part of 10000 is 1? Is 3? Is 11?

What is $\frac{1}{10}$ of 1? $\frac{1}{10}$ of $\frac{1}{10}$? $\frac{1}{10}$ of $\frac{1}{100}$? $\frac{1}{10}$ of $\frac{1}{1000}$?

What is $\frac{1}{10}$ of 3? $\frac{1}{10}$ of $\frac{3}{10}$? $\frac{1}{10}$ of $\frac{3}{100}$? $\frac{1}{10}$ of $\frac{3}{1000}$?

What is 1 less 3 tenths? 1 less 3 hundreths? 1 less 8 thousandths?

2. A THE READING AND WRITING OF DECIMALS.

When a unit is thus divided into tenths, hundredths, thousandths, etc., the parts are called *Decimal* parts, or *Decimal Fractions.*

Decimal Fractions have no expressed denominator, but are written in Arabic or Decimal notation.

Thus, 1 tenth is written   .1 $\frac{7}{10}$ =.7

     1 hundredth   .01 $\frac{15}{100}$ =.15

     1 thousandth   .001 $\frac{216}{1000}$ =.216

     3 tenths   .3 $\frac{209}{1000}$ =.209

     3 hundredths   .03

     3 thousandths   .003

Do decimals decrease from left to right? By what scale?

READ THE FOLLOWING:

.3	.02	.002	3.1	62.01	3.003
.5	.09	.015	2.9	165.13	3.033
.7	.13	.216	18.7	418.09	3.333

EXPRESS DECIMALLY:

$\frac{5}{10}$ $\frac{7}{100}$ $\frac{9}{1000}$ $\frac{216}{1000}$ $\frac{7}{10000}$ $\frac{446}{10000}$ $3\frac{8}{10}$

$\frac{7}{10}$ $\frac{19}{100}$ $\frac{12}{1000}$ $\frac{203}{1000}$ $\frac{18}{10000}$ $\frac{199}{10000}$ $3\frac{8}{100}$

$16\frac{7}{1000}$ $54\frac{146}{10000}$ 379 and 17 ten-thousandths.

$32\frac{12}{1000}$ $318\frac{309}{1000}$ 3746 and 6275 ten-thousandths.

READ:

2697.021	78654.0001	740687.0019
1500.009	19.1678	9008.3005
201.201	278.3059	3846279.216859

DECIMAL TABLE.

Etc. Hundred-Billions. Ten-Billions. BILLIONS. Hundred-Millions. Ten-Millions. MILLIONS. Hundred-Thousands. Ten-Thousands. THOUSANDS. Hundreds. Tens. ONES. • Decimal Point. Tenths. Hundredths. Thousandths. Ten-Thousandths. Hundred-Thousandths. Millionths. Ten-Millionths. Hundred-Millionths. Billionths. Ten-Billionths. Hundred Billionths. Etc.

How much greater is
10 than 1?   100000 than 1?
100 " 1?   1000000 " 1?
1000 " 1?
10000 " 1?

How much greater is
.1 than .01?   .3 than .03?
.01 " .001?   .6789 " .06789?
.001 " .0001?
.0001 " .00001?

3. B   ADDITION OF DECIMALS.

7 tenths and 3 tenths are how many units? 8 tenths and 9 tenths? 7 tenths, 8 tenths, and 5 tenths? Four and 3 tenths and seven and 1 tenth?

WRITTEN WORK.   ADD:

(1)	(2)	(3)	(4)	(5)
3.2	14.08	16.052	15.3	.2
6.9	9.07	3.008	37.05	.91
4.8	21.36	19.125	196.008	.608

6. Add 8 tenths, 56 hundredths, 17 hundredths, 218 thousandths.   ANS. 1.243.

7. Add 20.5, 13.16, 9.002, .207, and 48.5007.

8. Add 13 and 4 tenths, 78 and 15 hundredths, 901 and 7 thousandths, and 168 and 15 ten-thousandths.   ANS. 1160.5585.

9. Express decimally and add: $\frac{7}{10}$, $\frac{15}{100}$, $\frac{6}{1000}$, $\frac{18}{1000}$.

10. $\frac{19}{100} + \frac{18}{1000} + \frac{258}{1000} + \frac{187}{1000} + \frac{9}{100000} = ?$

11. What whole number is equal to .18+.256+.384+.5678+.6122?   ANS. 2.

12. What whole number is equal to 10—(.3+.16+.209+.7865+.0008+3.5437)?   ANS. 5.

13. .2 yd.+.316 yd.+5.1895 yd.+.705 yd.= ?

14. .9 ft.+.74 ft.+.86 ft.+.5 ft.=how many yards?

15. 3.7 mo+9.2 mo.+.816 mo.+10.284 mo.=how many years?

4 D   SUBTRACTION OF DECIMALS.

What is 1 less 3 tenths? 2 less 5 tenths? 6 less 8 tenths? What must be added to 6.3 to make 7? What must be added to 4 tenths to make 1? To 97 hundreths to make 1?

WRITTEN WORK.

SUBTRACT:

(1)	(2)	(3)	(4)	(5)
40.35	13.95	32.07	12.30	18.3
16.04	8.26	9.16	9.65	6.47

(6)	(7)	(8)	(9)	(10)
16.5	35.00	45.	18.090	27.7
9.75	18.24	19.56	6.741	6.009

11. From 6.7 subtract 18 thousandths.

12. From 9 subtract 9 thousandths.

13. From 14.3 subtract the sum of .55+.609.

14. From .5 of a year take .25 year. —— How many months?

15. From $8.169 take $3.408.

5.   MULTIPLICATION OF DECIMALS.

COMPLETE:

$3 \times \frac{1}{100} =$ $6 \times \frac{2}{10} = \frac{12}{10}$ or $1\frac{2}{10}$ $3 \times 2\frac{1}{10} =$

$3 \times .01 =$ $6 \times .2 =$ $3 \times 2.1 =$

$5 \times \frac{1}{100} =$ $7 \times .8 =$ $5 \times 3\frac{1}{100} =$

$5 \times .01 =$ $5 \times \frac{2}{10} =$ $5 \times 3.01 =$

$9 \times \frac{7}{100} =$ $5 \times .2 =$ $5 \times 7\frac{2}{10} =$

$9 \times .07 =$ $5 \times .02 =$ $5 \times 7.2 =$

MUPTIPLY:

3.07	9.4	3.007	8.016	7.748
8	9	6	7	9

$\frac{3}{10} \times \frac{3}{10}$ $\frac{4}{10} \times \frac{3}{10}$ $\frac{27}{100} \times \frac{6}{10}$ $\frac{3}{100} \times \frac{2}{10}$ $\frac{3}{1000} \times \frac{3}{10}$

.3×.3   .4×.3   .27×.6   .03×.2   .003×.3

1. $\frac{16}{100} \times \frac{4}{100} = ?$

.16   How many decimal places in the multipli-
.04   cand? In the multiplier? In both? · In the
———   product?
.0064

2. What is the product of .81 and .06?

. 3. 3.5×8.7=?

. 4. Multiply .016 by .3.

5. (3.7+6.8)×(17.8—12.15)=?

6. What is the cost of 6 sheep at $2.125 each?

What is the product of 8 multiplied by 10? .8 multiplied by 10? .08 multiplied by 10?

Multiplying a number by 10 moves the decimal point how far to the right? .

· **6**   SIGHT WORK.

Multiply the following by 10:

16   1.6   .16   7   .7   .07   .007   .14   .014
$8 $ .85 $3.75

What is the product of 9 multiplied by 100? .09 multiplied by 100? .009 multiplied by 100?

Multiplying a number by 100 moves the decimal point how far to the right?

SIGHT WORK.

MULTIPLY BY 100:

19   1.9   .19   .019   .0019   43.7   · 4.37
.437   .0487   .00437 $9 $ .95 $ .07

What is the product of 6 multiplied by 1000?   .006 multiplied by 1000?

Multiplying a number by 1000 moves the decimal point how far to the right?

SIGHT WORK.

MULTIPLY BY 1000:

    38   3.8   .38   .038   .0038   785   78.5
        $7.85 $ .785   .0785   .00785   .000785

7. C.   DIVISION OF DECIMALS.

MENTAL WORK.

What is

$\frac{1}{3}$ of $\frac{18}{100}$	$\frac{1}{3}$ of $6\frac{9}{10}$	$\frac{1}{5}$ of $40\frac{15}{100}$
$\frac{1}{3}$ of .18	$\frac{1}{3}$ of 6.9	$\frac{1}{5}$ of 40.15
$\frac{1}{4}$ of $\frac{32}{1000}$	$\frac{1}{3}$ of $18\frac{6}{10}$	$\frac{1}{2}$ of 12.08
$\frac{1}{4}$ of .032	$\frac{1}{3}$ of 18.6	$\frac{1}{6}$ of 24.006

WRITTEN WORK.

1. Take $\frac{1}{3}$ of .9, $\frac{1}{4}$ of .8, $\frac{1}{5}$ of .5, and add the results.
2. Take $\frac{1}{4}$ of .24, $\frac{1}{5}$ of .15, $\frac{1}{6}$ of .54, $\frac{1}{3}$ of .09.   Add.
3. What is the quotient of 18.25 divided by 5 ?
4. 23.008÷4=?
5. Divide $20.40 equally among 5 boys.
6. If 16.24 acres of land be divided into 8 equal lots, how many acres will there be in each?
7. $\frac{1}{3}$ of 15.18 less $\frac{1}{7}$ of .049 equals what?   Write a problem for $16÷$4.   One for $\frac{1}{4}$ of $32.44.

8.   MENTAL WORK.

How many tenths in 1 ? $1÷\frac{1}{10}=$?
How many tenths in 6 ? $6÷\frac{1}{10}=$?
How many hundredths in 1 ?   In 5 ? In 7 ?
How many thousandths in 1 ?   In 9 ?   In 17 ?
How many 2-tenths in 8 tenths ?
How many 3-hundredths in 9 hundredths ? In 12 hundredths?   In 21 hundredths?

From a plot of ground 9 tenths of an acre in area how many plots each 3 tenths of an acre in area can be made?

COMPLETE :.

$1 \div \frac{1}{10} =$	$1 \div \frac{1}{100} =$	$1 \div \frac{1}{1000} =$	$\frac{8}{10} \div \frac{2}{10} =$
$1 \div .1 =$	$1 \div .01 =$	$1 \div .001 =$	$.8 \div .2 =$
$2 \div \frac{1}{10} =$	$5 \div \frac{1}{100} =$	$7 \div \frac{1}{1000} =$	$.12 \div .06 =$
$2 \div .1 =$	$5 \div .01 =$	$7 \div .001 =$	$.48 \div .24 =$

WRITTEN WORK.

1. Divide 18 by 3 thousandths.

In common fractions: $18 \div \frac{3}{1000} = \dfrac{18 \times 1000}{3} = 6000$

In decimal fractions: $.003 \underline{|\ 18.000}$
  6000

{ How many decimal places in the dividend? In the divisor? How many more in the dividend? How many in the quotient?

2. Divide 7 by 4 hundredths in two ways.

3. Divide 36 by 18 hundredths.

4. Divide 35 by .07. By .05. By .35. Add the quotients.   ANS. 1300.

5. Divide 8 by .004. By .002. By .001. Add.

6. Divide 28 by .7. By .04. By .14. Add. ANS. 940.

7. Divide 36 by 18. By .18. By .02. By .2. By .36. Add.   ANS. 2282.

8. How much more is $42 \div .07$ than $42 \div .7$?

9. What is the difference between $56 \div .007$ and $56 \div .014$?

10. How much more is $25 \div .005$ than $25 \times .005$?

9.

1. Divide 46.044 by 12. $12 \underline{|\ 46.044}$
                  3.837

2. If 9 loads of hay cost $42.75, what is that for 1 ?

3. Divide 18.25 by 2 5.

$$2.5 \,\lfloor\, 18.25$$
$$\overline{\quad 7.3 \quad}$$

How many more decimal places in the dividend than in the divisor? How many in the quotient?

4. Divide 4.128 by .08.   Ans. 51.6

PROOF:—$4.128 \div .08 = \dfrac{4.128 \times 100}{8} = \dfrac{412.8}{8} = 51.6$

5. $8.236 \div .04 = ?$

6. $8.236 \div .004 = ?$

7. Divide 6.125 by 5.

8. What is $\frac{1}{3}$ of .315 ? $\frac{1}{3}$ of $\frac{315}{1000}$?

9. What is $\frac{3}{5}$ of .245 ?

10. What is $\frac{1}{8}$ of .016 ?

11. Divide .75 by .25.

12. Divide 17.28 by 4.8.   By .48.   Find the sum of the quotients.   Ans. 39.6.

13. Divide 3.75 by .5.   By .05.   Find the difference of the quotients.

14. From $\frac{1}{8}$ of 64 take $\frac{1}{7}$ of .056.

15. Take $\frac{1}{5}$ of .5, .05, .005; add.   Ans. .111.

16. Take $\frac{1}{9}$ of 1.8, .18, .018; add.

17. At 75 cents a bushel how many bushels of potatoes can be bought for $33.75 ?

18. If 19 bushels of corn cost $16.15, what is that per bushel?

19. If 48 pounds of butter cost $12, what is the price per pound?   Prove it.

20. If 40 yards of cashmere cost $35, what is the price per yard?   Prove it.

10.   TABLE OF UNITED STATES MONEY.

10 mills = 1 cent ($ .01).
10 cents = 1 dime ($ .10).
10 dimes = 1 dollar ($ 1).

One dollar is equal to how many dimes?   To how many cents?   To how many mills?

One mill is what part of a dollar? One cent? One dime?

How many dimes in $5? In $6½? In $13.50?

How many cents in $9? In $9½? In $6.85? In $2.37?

How many mills in $ .02? In $ .15? In $6? In $9.85? In $4.625?

How many dollars in 60 dimes? In 900 cents? In 3000 mills? In 135 dimes? In 696 cents? In 3875 mills?

Dividing a number by 10 moves the decimal point how far to the left? Dividing by a hundred? Dividing by a thousand?

SIGHT WORK.

Take $\frac{1}{10}$ of the following:

780   6.95   69.5   6.95   .695 $8 $7.50

Take $\frac{1}{100}$ of the following:

967   84.4   8.32   2.75   .08   .009

Take $\frac{1}{1000}$ of the following:

4725   472.5   47.25   4.725

II.

What is the cost of 3875 pounds of hay at 75¢ per hundred?   ANS. 38.75×$.75=$29.06¼.

2. Of 3800 pounds at $.90 per hundred?

3. Of 4650 pounds at $1¼ per hundred?   ANS. $58.12½.

4. Find the cost of 20000 shingles at $2¼ per thousand?

5. Of 78500 at $3 per thousand?

6. Of 21000 bricks at $7.50 per thousand?

7. Of 8000 pounds of hay at $13 a ton?
          (2000 lbs.= 1 ton.)

8. Of 9350 pounds at $15 a ton?

9. Of 7560 pounds at $8 a ton?

12.   REDUCTION OF DECIMALS.

1. Reduce $\frac{3}{25}$ to 100ths.

First method : $\frac{3}{25} \times \frac{4}{4} = \frac{12}{100}$ or .12 (Annex decimal ci-

Second method : 25 | 3.00   pher to the numer-
                     ───────   ator and divide by
                        .12   the denominator.)

2. Reduce $\frac{5}{18}$ to a decimal.

3. $\frac{5}{6}$ 5. $\frac{1}{6}$ ANS. .16$\frac{2}{3}$ 7. $\frac{3}{14}$ 9. $\frac{13}{18}$

4. $\frac{5}{7}$ 6. $\frac{2}{7}$ 8. $\frac{11}{24}$ 10. $\frac{3}{4} \times \frac{2}{8}$

3. Reduce each to the decimal of a dollar and memorize :

$\$\frac{1}{6}$ $\$\frac{3}{4}$ $\$\frac{1}{4}$ $\$\frac{1}{12}$
$\$\frac{3}{4}$ $\$\frac{1}{8}$ $\$\frac{5}{8}$ $\$\frac{1}{16}$
$\$\frac{1}{4}$ $\$\frac{5}{8}$ $\$\frac{7}{8}$ $\$\frac{3}{16}$

CHANGE TO COMMON FRACTIONS OF THE SIMPLEST FORM :

.25	.625	8.25	4.18$\frac{3}{4}$	7.66$\frac{2}{3}$
.125	.0242	3.75	7.56$\frac{1}{4}$	8.37$\frac{1}{2}$
.035	.003	9.125	9.06$\frac{1}{4}$	4.83$\frac{1}{3}$

CHAPTER VII.

1.   DENOMINATE NUMBERS.

A Denominate Number is a concrete number denoting a weight or measure; as 9 wk., 5 ft., 6 lb.

A Simple Number is one whose units are all of the same kind or denomination; as 18, 3 yd., 9 oz.

A Denominate Number consists of units of different names or denominations; as, 7 wk. 3 day., 9 ft. 10 in.

In Simple Numbers ten units of any order always equal one unit of the next higher order.

In Compound Numbers the number of units of one order which make one unit of the next higher order varies.

How many units=1 ten? How many hundreds=1 thousand? How many quarts=1 gallon? How many minutes=1 hour?

2.   TABLES OF WEIGHTS AND MEASURES.

DRY MEASURE.

Dry measure is used in measuring all dry articles; as grain, fruit, etc.

Its units or denominations are pints, quarts, pecks, and bushels.

TABLE.

2 pt.=1 qt.
8 qt.=1 pk.
4 pk.=1 bu.

MENTAL WORK.

How many pints in	How many quarts in	How many pecks in
5 qt.	2 pk.	3 bu.
6½ qt.	1 bu.	7½ bu.
1 pk.	3 bu.	3¼ bu.
3 pk.	16 pt.	24 qt.
1 bu.	3½ pk.	30 qt.
2 bu.	2 pk. 3 qt.	32 pt.

WRITTEN WORK.

1. Reduce 7 bu. 3 pk. 5 qt. to pints.

ANALYSIS.

1 bu.=4 pk.
7 bu.=7×4 pk.=28 pk.
_____

28 pk.+3 pk.=31 pk.
1 pk.=8 qt.
31 pk.=31×8 qt.=248 qt.
248 qt.+5 qt.=253 qt.
1 qt.=2 pt.
253 qt.=253×2 pt.=506 pt.
506 pt.+1 pt.=507 pt.
7 bu. 3 pk. 5 qt. 1 pt=507 pt.

In Practice.

7 bu. 3 pk. 5 qt. 1 pt.
4   In practice the
___   multiplicands
28   are used as
3   multipliers.
___   The result wil
31 pk.   be the same.
8
___
248
5
___
253 qt.
2
___
506 pt.
1
___
507 pt.

2. Reduce 9 bu. 3 pk. 4 qt. 1 pt. to pints.   Ans. 633 pt.

2. How many qts. in 7 bu. 3 pk. 5 qt.?

4. How many pts. in 2 pk. 7 qt. 1 pt.?   Ans. 47 pt.

5. What will 3 pk. 3 qt. 1 pt. berries cost at 5 cents a pint?   Ans. $2.75.

6. What will 8 bu. 3½ pk. tomatoes cost at 20 cents a quart?   Ans. $56.80.

7. What will 3¾ bu. potatoes cost at 35 cents a peck?
                                                Ans. $5¼.

8. What will a bushel of cherries cost at the rate of 20 cents a qt.?   Ans. 32×20c=$6.40.

9. At the rate of 15 cents a qt. how many bushels of cherries can be bought for $9.60?

10. Buy 2 bu. berries for $3.75; sell at 10c. a pt.; find gain.

1. Reduce 243 pints to bushels.

ANALYSIS.

1 pt.=½ qt.	In practice.
243 pt.=²⁴³⁄₂qt.=121 qt.+1 pt.	2 | 248 pt.
1 qt.=⅛ pk.	8 | 121 qt.+1 pt.
121 qt.=¹²¹⁄₈ pk.=15 pk.+1 qt.	4 | 15 pk.+1 qt.
1 pk.=¼ bu.	3 bu. 3 pk.
15 pk.=¹⁵⁄₄ bu.=3 bu.+3 pk.	
243 pt.=3 bu. 3 pk. 1 qt. 1 pt.	

2. How many bushels in 749 pt.?

3. How many pecks in 213 qt.?

4. What will be the cost of 512 pt. ground-peas at the rate of $2½ a bushel?   (How many pts. in 1 bu.?)

5. What will be the cost of 288 qt. of plums at the rate of $1.33⅓ a bushel?   (How many qts. in 1 bu?   )

3.   LIQUID MEASURE.

.4 gills=1 pint.
2 pints=1 quart.
4 quarts=1 gallon.

MENTAL WORK.

How many gills in each?	How many pints in each?	How many quarts in each?
3 pints.	3 qt.	5 gal.
1 quart.	1 gal.	16 pt.
4 quarts.	5 gal.	40 gi.
1 gallon.	12 gi.	How many gallons. in each?
5½ pt.	13½ qt.	80 qt.
3¼ pt.	2½ gal.	120 pt.

WRITTEN WORK.

1. Reduce 3 gal. 2 qt. 1 pt. to pints.

2. 18 gal. 1 qt 1. pt. 2 gi. to gills.

3. How many gallons etc., in 1008 gi.?

4. What will 7 gal. milk cost at the rate of 7c. a pt.?

5. How long will 8¾ gal. kerosene last if a half quart is used every day?

6. How many quarts vinegar in 4 bbl., each containing 31½ gal.?

7. How many quarts vinegar in 8 hogsheads (hhd.) each containing 63 gal.?

4. AVOIRDUPOIS WEIGHT.

This weight is used in weighing heavy and common articles as coal, groceries, etc.

TABLE.

16 ounces (oz.)=1 pound (lb.).
100 lb.=1 hundred weight (cwt.).
20 cwt., or 2000 lb.=1 Ton (T.).

MENTAL WORK.

How many oz. in ¾ lb.? in 2¼ lb.? in 5⅛ lb.?
How many lbs. in 64 oz.? in 24 oz.? in 36 oz.?
How many cwt. in 787 lb.? in 5625 lb.?
How many tons in 9250 lb.? in 8225 lb.?

WRITTEN WORK.

1. Reduce 1 T. 88 lb. 15 oz. to ounces.

2. Find the freight charges on 75000 lb. coal at $3.25 a ton.   Ans. $121.87½.

8. Find the cost of 5650 lb. hay at $1.20 a cwt.

4. At the rate of ½c. an oz. what will be the postage on a package weighing 3½ lb.?

5. Find the cost of 3½ lb. butter @ 32c, 5¼ lb. @ 30c;, and 8¾ lb. @ 25c.   Ans. $4.88¼.

6. Find the cost of 7 lb. 8 oz. cheese at 30c a lb.

7. What will 3 lb. 12 oz. chocolate cost at $1.20 a lb.?

8. How many sacks each holding 50 lb. will be needed for 3 tons of wheat?

5.   TROY WEIGHT.

Troy weight is used in weighing gold, silver, and jewels. Its denominations are grains, pennyweights. ounces and pounds.

TABLE.

24 gr.=1 pwt.
20 pwt.=1 oz.
12 oz.=1 lb.

WRITTEN WORK.

1. How many grains in 1 lb. of gold?
2. What will be paid for 18 pwt. 12 gr. of old gold jewelry at $.40 a pwt.?
3. How many grains of gold in 5 ounces?
4. Reduce 21230 gr. to higher orders.

6.   APOTHECARIES' WEIGHT.

This weight is used in prescribing and mixing dry medicines.

TABLE.

20 grains (gr.)=1 scruple (Ə)
3 scruples=1 dram (ʒ).
8 drams=1 ounce (℥).
12 ounces=1 pound (℔.)

7.   LONG OR LINEAR MEASURE.

Long measure is used in measuring lines and distances.

TABLE.

12 inches (in.)$=$1 foot (ft.).
3 feet$=$1 yard (yd.).   •

$\left.\begin{array}{l}5\frac{1}{2}\text{ yd.}\\16\frac{1}{2}\text{ ft.}\end{array}\right\}=$1 rod (rd.)

$\left.\begin{array}{l}320\text{ rd.}\\1760\text{ yd.}\\5280\text{ ft.}\end{array}\right\}=$1 mile (mi.).

WRITTEN WORK.

1. How many inches in the boundary of a rectangle 9 in. long, 12 in. wide? How many feet?

2. How many yards in the boundary of an 8-foot square?

3. Reduce 18 rd. to inches.   ANS. 1188 in.

4. Reduce 2376 in. to rods.

5. $5\frac{1}{2}$ mi.$=$how many feet?

6. Reduce $3\frac{1}{2}$ miles to rods. To yards.

7. Reduce 13200 ft. to miles.

8. How many rods around a rectangular field 85 yd. long, 75 yd. wide?

9. Reduce 2 mi. 18 rd. to feet.

10. Reduce 3 mi. 560 yd. to yards.

8.   SQUARE MEASURE.

Measure accurately and draw a square 1 foot, or 12 inches, on a side. Lay off this square foot in inch squares. How many square inches in 1 square foot?

Draw a square 3 ft. or 1 yd. on a side. Lay it off in square feet. How many sq. ft. in 1 sq. yd.?

A square 2 yd. on a side contains how many square feet?

What is $5\frac{1}{2}\times5\frac{1}{2}$? A square $5\frac{1}{2}$ yd. on a side contains how many sq. yd.? How many rods long is a side of this square? How many square rods does it contain?

SQUARE MEASURE, OR SURFACE MEASURE.

144 sq. in.=1 sq. ft.
9 sq. ft.=1 sq. yd.
30¼ sq. yd.=1 sq. rd.
160 sq. rd.=1 acre (A.)
640 A.=1 sq. mi.

WRITTEN WORK.

1. How many sq. in. may be laid off on a rectangle 18 in. long, 1 ft. wide? (Make diagram.)

2. How many sq. ft. in a rectangle 2 yd. long, 3 ft. wide? How many sq. yd.? (Diagram.)

3. Make drawing of a surface 2 yd. square. How many sq. ft. does it contain?

4. A hall 27 ft. long, 4 yd. wide contains how many sq. yd.? How many sq. ft.? (Diagram.)

5. How many square yards in a room 15 ft. square?

6. How many square yards in a surface 8 yd. by 10 yd.? How many sq. ft. is that?

7. Find the area in square rods of a rectangular field 20 rd. by 16 rd. Reduce to acres.

8. How many acres in a rectangular field 32 rd. by 40 rd.?   ANS. 8 A.

9. Find the area in square rods of a surface 16 rd. by 12 rd. Reduce to sq. ft.   ANS. 5808 sq. ft.

10. How many sq. ft. in a surface 40 rd. by 18 rd?

11. Find the area in square rods of a tract ½ mi. long ¼ mi. wide. (How many rods long and broad?)

12. How many acres in a surface ½ mi. long ⅛ mi. wide?   ANS. 16 A.

13. A square plot of ground 2 mi. on a side contains how many acres?

14. A square tract of 5760 acres contains how many square miles? How long is each side of this tract?   ANS. 3 miles.

15. How many acres in a tract of 2560 square rods?

16. How many sq. rd. in a field whose area is 3 A. 90 sq. rd. ?

17. The area of a certain rectangle is 150 square inches, its length is 15 in.; find breadth.

18. The area of a certain rectangle is 324 sq. ft., its length 9 yd.; find breadth.   ANS. 4 yd.

**9.**   CUBIC MEASURE.
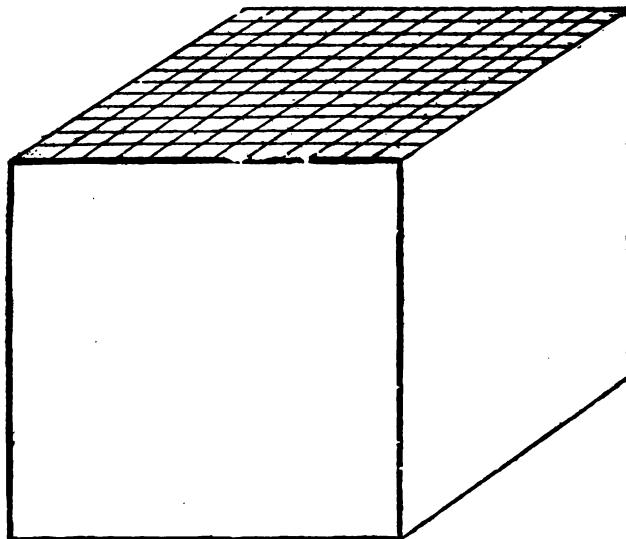
1.   How many inch cubes in this pile of blocks which is 12 in. high, 12 in. long, and 12 in. wide?

How many cubic inches in a cubic foot?

Draw the diagram of a cube 3 feet each way. How long is each edge of the cube? How many square feet on each surface? If this cube, or cubic yard, be cut into cubic feet, how many will there be?

How many cubic feet in a cubic yard?
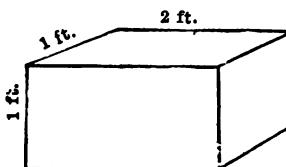
2. Diagram of a rectangular solid 1 ft. high, 1 ft. wide, 2 ft. long.

How many faces of this solid are squares?

How many are rectangles 2 ft. by 1 ft.?

How many edges are 1 ft. long? How many edges are 2 ft. in length?

How many cubic feet in the solid? How many cubic inches?

3. Diagram of a solid, 1 yd. high, 1 yd. wide, 3 yd. long.
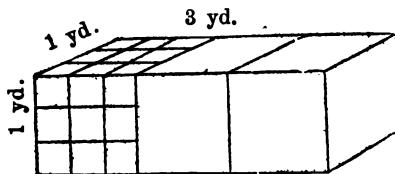
How many faces of this solid are square rectangles? How many faces are oblong rectangles? What is the area of each square face?

What is the area of each square face that is an oblong rectangle?

How many solid feet in one-third of the solid? How many in two-thirds of it? How many in the entire solid? 3 cubic yds.= how many cu. ft.?

TABLE.

1728 cubic inches (cu. in.)=1 cubic foot (cu. ft.)
27 cubic feet=1 cubic yard (cu. yd.)

WRITTEN WORK.

1. How many cu. in. in a rectangular solid 3 ft. long, 1 ft. wide,1 ft. high? (Diagram.)

2. A cube whose edges are each 2 ft. long is how many times as large as one whose edges are each 1 ft. long? (Diagrams.)

3. How many more cubic inches in a cube 2 feet each way than in a cubic foot? (Diagrams.)

                                                    ANS. 12096 cu. in.

4. How many cubic yards in a block of granite 2 yd. high, 3 yd. wide, 4 yd. long? How many cubic feet?

WRITE CORRECT ANSWERS:

1. How many dimensions does a line have? 2. A surface? 3. A solid?

4. How does a square rectangle differ from an oblong rectangle?

5. How does a cube differ from any other rectangular solid?
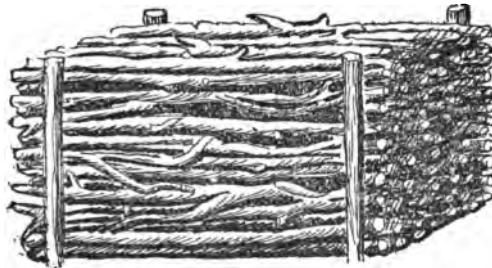
A CORD OF WOOD.

A pile of wood 8 ft. long, 4 ft. wide, 4. ft. high equals 1 cord.

How many cubic feet in one cord of wood?

Give the dimensions of a pile of wood containing 2 cords, 3 cords, 4 cords. (Diagrams.)

Think of a pile of wood 8 ft. long, 8 ft. high, 4 ft. wide. How many cords do you see?

Think of a pile 16 ft. long, 4 ft. wide, 8 ft. high. How many cords?

Think of a pile 32 ft. long, 4 ft. wide, 8 ft. high. How many cords?

A certain pile of wood is 40 ft. long, 4 ft. wide, and contains 10 cords; how high is it?

A pile that is 8 ft. long, 8 ft. wide, 4 ft. high, contains how many cords? (Diagram.) A pile twice that high contains how many cords?

A pile of wood 8 ft. each way contains how many cubic feet? (Two solutions.)

10.   ENGLISH MONEY.

English or Sterling Money is the currency of Great. Britain.

TABLE.

4 farthings (far.)=1 penny (d.).
12 pence=1 shilling (s.).
20 shillings=1 pound (£.).

The gold coin representing the pound is the *Sovereign;* the *Guinea* is a gold coin worth 21 s.; the *Crown* is a silver coin worth 5 s. The pound is worth about $4.85 in U. S. money.

WRITTEN WORK.

1. Reduce £ 7 6 s. 3 d. to pence.
2. How many pounds etc. in 5280 far.?
3. How many pence in£ 5.25?   Ans. 1260 d.
4. How many farthings in 8.5 s.?   Ans. 408 far.
5. What part of a pound is 480 far.?

11.   TIME TABLE.

60 seconds=1 minute.
60 minutes=1 hour.
24 hours=1 day.
365 days=1 common year.
366 days=1 leap year.
100 years==1 century.

[From the almanac find which months of the year have 31 days, which 30, and which month varies in its number of days.]

12.   WRITTEN WORK.

1. Reduce 9 da. 7 hr. 15 min. to minutes.
2. Reduce to days etc. 4,635,760 seconds.

3. If I buy 5 quarts of milk every day, how many gallons will that be in 3 weeks?

4. .25 da. is how many hrs.?

5. Add ½ da., .33⅓ da., 2½ da., 9 hr. Ans. 89 hr.

13. CIRCULAR MEASURE.

Circular measure is used in measuring angles and arcs, latitude and longitude.

A Circle is a plane figure bounded by a curved line, all points of which are equally distant from a point within called the *centre*, The bounding line of a circle is called its Circumference.

A diameter of a circle is a straight line passing through the centre and terminated by the circumference. Are all the diameters of a circle equal?

Every circumference is made up of 360 equal parts called *degrees*. Any part of a circumference is an *arc*.

An arc of 180 degrees is what part of a circumference? An arc of 90 degrees is what part of a circumference?

The half of a circle is called a *semi-circle*; one-fourth of a circle, a *quadrant*; one-sixth of a circle, a *sextant*.

How many degrees in the arc of a semi-circle? Of a quadrant? Of a sextant?

Each degree of a circumference is made up of minutes, and each minute of seconds.

TABLE.

60 seconds (60″)=1 minute (1′).
60 minutes=1 degree (1°).
360 degrees=1 circumference (cir).

14. MISCELLANEOUS TABLE.

12 things=1 dozen.
12 dozen=1 gross.
20 things=1 score.
24 sheets=1 quire paper.
20 quires=1 ream.
196 lb. flour=1 barrel.
1 gallon=231 cu. in.
6 feet=1 fathom.
3 miles=1 league.

15. ADDITION AND SUBTRACTION OF COMPOUND NUMBERS.

1. Add 6 yd. 2 ft. 8 in., 5 yd. 2 ft. 5 in., and 2 ft. 9 in.

yd.	ft.	in.	
6	2	8	9 in.+5 in.+8 in.=22 in., or 1 ft. 10 in.
5	2	5	1 ft.+2 ft.+2 ft.+2 ft.=7 ft., or 2 yd. 1 ft.
	2	9	2 yd.+5 yd.+6 yd.=13 yd.
14	1	10	

2. From 7 bu. 3 pk. 2 qt. subtract 2 bu. 1 pk. 5 qt.

bu.	pk.	qt.	
7	3	2	Take 1 pk. from 3 pk., reduce to quarts
2	1	5	and add to 2 qt. 8 qt.+2 qt.—5 qt.=5 qt.
			2 pk.—1 pk.=1 pk.
5	1	5	7 bu.—2 bu.=5 bu.

ADD:

3.				4.			5.	
gal.	qt.	pt.	gi.	mi.	rd.	yd.	mi.	yd.
7	3	1	3	13	56	3	6	980
9	2	1	2	25	78	5	18	720
4	1	0	1	95	318	3	34	69

SUBTRACT:

6.			7.			8.		
hr.	min.	sec.	yr.	mo.	da.	yr.	mo.	da.
9	18	32	9	8	12	16	3	10
7	20	15	3	4	20	9	19	25

9.		10.		11.		
A.	rd.	sq. ft.	sq. in.	cu. yd.	cu. ft.	cu. in
9	48	32	18	13	18	640
3	75	19	65	9	25	800

12. A man borrowed $200 Jan. 15, 1891 and paid the debt July 28, 1892. For how long a time must he have paid interest?

	yr.	mo.	da.	
	1892	7	28	January is
	1891	1	15	what month of
				the year? July
Ans.	1	6	13	is what month?

13. Find the difference in time between Feb. 8, 1875, and March 13, 1880.

14. Between May 16, 1885 and Aug. 9, 1887.

15. Between Dec. 22, 1890 and May 7, 1892.

Ans. 1 yr. 4 mo. 15 da.

16. MULTIPLICATION OF COMPOUND NUMBERS.

1. Multiply 8 gal. 3 qt. 1 pt. by 7.

gal.	qt.	pt.	
3	3	1	7×1 pt.$=7$ pt. or 3 qt. 1 pt.
		7	7×3 qt.$=21$ qt.$+3$ qt.$=24$ qt. or 6 gal.
			7×3 gal.$=21$ gal. 21 gal.$+6$ gal.$=27$ gal.

27   1

2. Multiply 13 wk. 6 da. 7 hr. by 12.

3. What is the distance around a field each side of which is 42 rd. 4 yd. 2 ft.? Ans. 171 rd. 2 yd. 6 in.

rd.	yd.	ft.	
42	4	2	
		4	
171	1½	2	
	(½ yd.$=$)	1	6 in.
171	2	0	6 in.

4. Multiply 18 rd. 3 yd. 2 ft. by 8.

Ans. 149 yd. 1 rd. 2 ft. 6 in.

5. Multiply 42 rd. 18 ft. by 7. Ans. 301 rd. 10½ ft.

6. How many feet around a pentagon each side of which is 2 ft. 9 in.?

7. What is the combined length of the edges of a cube that is 7 ft. 9 in. long? Ans. 93 ft.

8. What is the combined length of the edges of a rectangular solid 5 ft. long, 8 ft. wide, 2 ft. high? (Diagram).

Ans. 13⅓ yd.

9. How many square feet on the surface of a cube each edge of which is 16 in. long? Ans. 10⅔ sq. ft.

10. Required the square inches on the surface of a rectangular prism 8 in. long, 5 in. wide, 2 in. high.

Ans. 132 sq. in.

11. How many cu. ft. in a solid 9 in. long, 16 in. high, and 12 in. wide?

17. DIVISION AND PARTITION OF COMPOUND NUMBERS.

1. What is $\frac{1}{8}$ of 13 wk. 4 da. 8 hr.?

By long division.   **By short division.**

8)13 wk. 4da. 8 hr.(1 wk.	8) wk. da. hr.
8	13 4 8

$$\overline{5}$$
$$7$$
$$\overline{35 \text{ da.}}$$
$$4 \text{ ``}$$
8)39 da.(4 da.
$$32$$
$$\overline{7}$$
$$24$$
$$\overline{168 \text{ hr.}}$$
$$8 \text{ ``}$$
8)176 hr.(22 hr.
$$176$$

ANALYSIS.

$\frac{1}{8}$ of 13 wk.=1 wk. and 5 wk. remainder. ($\frac{5}{8}$ wk. rem)

      5 wk.=35 da.

      35 da.+4 da.=39 da.

$\frac{1}{8}$ of 39 da.=4 da. and 7 da. remainder. ($\frac{7}{8}$ da. rem.)

      7 da.=168 hr.

      168 hr.+8 hr.=176 hr.

$\frac{1}{8}$ of 176 hr.=22 hr.

1 wk., 4 da., 22 hr. ANS.

2. What is $\frac{1}{7}$ of 47 bu. 2 pk. 3 qt.?

      ANS. 6 bu. 3 pk. 1 qt. 1$\frac{1}{7}$ pt.

3. What is $\frac{1}{3}$ of £56 7s. 6 d.?   ANS. £18 15s. 10d.

4. The distance around a square is 171 rd. 2 yd. 6 in. Required one side of the square. ANS. 42 rd. 4 yd. 2 ft.

5. What is $\frac{1}{8}$ of 149 rd. 1 yd. 2$\frac{1}{2}$ ft.?

      ANS. 18 rd. 3 yd. 2 ft.

6. What are the dimensions of a cube if the combined length of its edges is 96 ft.?

7. What is the length of one edge of a cube whose entire surface is 486 sq. in.? (First find area of one face.)

8. What is the length of one side of an equilateral, or equal-sided, triangle whose boundary is 26 ft. 3 in.?

9. How many sacks each to contain 2 bu. 3 pk., will hold 55 bu. of clover-seed?

1. CHAPTER VIII.

BILLS AND ACCOUNTS.

An *Account* is a record of goods sold, services rendered, or money paid by one person to another.

A *Debtor* is a person from whom a debt is due. A *Creditor* is the person to whom the debt is due.

A *Bill* is the creditor's written statement of the items in his account with the debtor.

Each item charged is called a *debit*; each item acknowledged as received is called a *credit*.

The *Balance* of an account is the difference between the footing, or sum, of the debits and that of the credits.

To *receipt* a bill is to write the creditor's name on the bill under the words "Received Payment," or "Paid."

A bill can be receipted only by the creditor or by a person authorized by him. Such person, in receipting, should write under the creditor's name his own name preceded by "per" or "by."

Copy these bills and extend and foot the items.

2. (1)

COLUMBUS, MISS., Dec. 1, 1892.

MISS JENNIE CLARKE,
            Bought of Morgan & Coles.

Nov.	10	3 qr. Note Paper	@ $.25,		
"	15	4 Blank Books	@ .15,		
"	23	Sketch-Book 40c. Birds and Bees 15c,			
"	29	Subscription Harper's Magazine,		4	00

Rec'd Payment,
            Morgan & Coles.

(2)

MILLEDGEVILLE, GA., Apr. 28, 1893.

MISS MARY P. JONES,
    To T. L. McComb & Co., Dr.

Apr.	4	To 12 yd. Lawn @ 25¢.		
"	8	" Gossamer, $2.50; Overshoes, 50¢.		
"	12	" 4 pr. Gloves @ $1.25:		
"	22	" 1 Tie 50¢, Fan, 75¢; Ribbon, 35¢.		
		Paid,		
		T. L. McComb & Co.		
		Per E. E. B.		

Make out and receipt the following bills:

1. Miss Lucy Yancey bought of D. W. McGregor & Co., Athens, Ga., May 1, 1893, a paper-cutter for 35 cents; May 8, an inkstand for 75 cents and a box of paper for 45 cents; May 20, 3 books at $1.50 each.

2. Mrs. G. H. Brooks, Dr. to Roberts and Moore for the following groceries: 1 barrel flour $7.50; 25 pounds sugar @ 6 cents; 6 dozen eggs @ 12½ cents; 7 chickens @ 30 cents; 2 pounds fruit @ 37½ cents.

3. Miss Anna Fryer bought of Julius Cohen & Co., of Memphis, Tenn., on June 3, 1893, 9 yards cashmere @ $1.25; 5 yards skirt lining, 7 cents; 2½ yards silesia @ 30 cents; 2½ dozen buttons, @ 40 cents; 3 spools silk @ 10 cents; 2 spools cotton @ 5 cents; 1 bolt braid, $1.25.

4. Mrs. J. P. Wilson, Dr. to her son George as follows: To 3 hours' work in garden @ 10 cents; 5 dozen eggs @ 12½ cents; 4 fares to the city @ 8 cents; cleaning out rose-garden, 80 cents; 3 baskets vegetables, 20 cents.

Imagine that it is the week before Christmas; you have a toy-store and a lady comes in and buys presents for her three children. Make out a bill of the things you think she would buy.

1. Ralph Bostick has a small garden and sells vegetables. On the first of May he had as cash on hand $3.50. He sold on May 7, Asparagus, 15 cents; May 8, Radishes, 5 cents; May 19, Beets, 25 cents; May 22, Peas, 60 cents; May 30, Strawberries, $1.20. Find total amount.

He spent the following sums: For a straw hat, $1.35; car fares, 15 cents; horse hire, 75 cents; garden seed 25 cents; a present for his mother, $1.25. Find amount.

With what sum did he begin the month of June?

Dr.		Cash.			Cr.	
1891						
May 1	To Balance	3	50	May 19 By 1 Straw Hat	1	35
" 7	Asparagus		15	" 20 Car Fares		15
" 8	Radishes		05	" 23 Present for M'h'r	1	25
" 19	Beets		25	" 25 Horse Hire		75
" 22	Peas		60	" " Garden Seed		25
" 30	Strawberries	1	20	31 Balance	2	
		5	75		5	75
Jun 1	To Balance	2				

Here is a page from his Cash Book showing the above transactions. Where do you find the cash on hand, $3.50, with which he began the month of May? All cash received is entered where? Cash paid out is entered where? How much money has he at the end of the month? How much must be added to the Credit side to make the two sides balance? Where is this $2 brought down on the first of June?

Here are his receipts for June:
June 2, 1 peck Irish Potatoes, 35 cents.
" 9, 2 quarts Beans @ 15 cents.
" 15, 4 quarts Beans @ 12½ cents.
" 20, Beans, 20 cents · Potatoes 15 cents.
" 28, Beans 20 cents; Potatoes, 30 cents; Squashes, 25 cents.

His expenditures are as follows:
June 5, Fishing tackle, 65 cents.
" 8, Cash to Harriet for mending coat, 30 cents.
" 30, " to Fresh Air Fund, 50 cents.

Make out and balance his account for June.

In July his receipts are $9.50 and his expenditures $2.75; What will be his cash on hand August 1?

ANS. $9.55.

2. During last month Allen Hunt received from his grandfather $2.75; from his mother $1.35; for sawing wood, 75 cents; for second-hand geography, 85 cents. He spent for a foot-ball, $2.25, for 2 rides on the merry-go-round, 10 cents each; for The Pathfinder, $1. With what sum did he begin the new month?

3. Lucia received for sewing, $1.25; for two picture frames, 37½ cents each; for a calendar, $1.50. She paid 75 cents for paints and brushes, and 45 cents for other materials. What were her profits?

4. Rosa's account-book shows on the first of December a balance of $7.65. On the 13th she received $4.50 from a music pupil and on the 18th, $6.85 for sewing. Her expenditures are as follows: Dec. 17, Shoes, $2.50; Hat, $4. Dec. 23, For Christmas presents, $5.85. Dec. 24, Cash to Children's Aid Society, $2.00. Make a balance sheet for the month.

5. Make a real or imaginary balance sheet of your own receipts and expenditures for the present month.

CHAPTER IX.

PERCENTAGE.
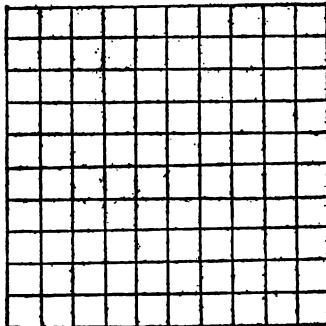
DIAGRAM OF A TEN-INCH SQUARE.

MENTAL WORK.

1. PER CENT is an abreviation of the Latin word, *per centum*, and means *by the hundred*. Thus, 6 per cent of a number means $\frac{6}{100}$ of it.

One square inch is what part of a 10-inch square? .

ANSWER: $\frac{1}{100}$ or 1 per cent. (Written also 1%.)

Two square inches is what part? 3 square inches? 7 square inches?

Eleven per cent of the square is how many square inches?

Fifty per cent of the square is what part of it?

Twenty-five per cent is what part? Seventy-five per cent is what part?

If 10 square inches be taken away, what per cent will be left?

What is 8 % of 100 trees? 10 % of 100 men? 6 % of 100 horses? 6 % of 300 horses?

What part of a number is 50 % of it? 25 %? 75 %? 10 %?

What is 50 % of 16? 25 % of 24? 75 % of 12? 10 % of 70?

2.   WRITTEN WORK.

EXPRESS AS PER CENT.

$\frac{3}{100}$	.16	.87$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{10}$
$\frac{8}{100}$	.25	.12$\frac{1}{2}$	$\frac{1}{4}$	$\frac{1}{3}$
$\frac{25}{100}$	.42	.16$\frac{2}{3}$	$\frac{3}{4}$	$\frac{2}{3}$

EXPRESS EACH AS A COMMON FRACTION IN ITS SIMPLEST FORM :

50%	40%	12$\frac{1}{2}$% (.12$\frac{1}{2}$=$\frac{1}{8}$).
25%	60%	37$\frac{1}{2}$%
75%	.25	16$\frac{2}{3}$%
10%	.74	.33$\frac{1}{3}$
20%	.90	.66$\frac{2}{3}$

3.

In percentage the unit or whole number is regarded as consisting of one hundred parts. This number is called the Base.

The number of hundredths (or the per cent.) taken of the Base is called the Rate.

The part of the Base taken (as so many hundredths, or such a per cent of it) is called the Percentage.

What is 7% of 900 trees? (In this problem what is the 900 trees? What is the rate? What is the percentage?)

What is 8% of 5 bushels? (What is to be found?)

What is 25% of 320 days? (Simply take $\frac{1}{4}$ of 320 days. Why?)

WRITTEN WORK.

FIND THE PERCENTAGE, IN EACH CASE USING THE SHORTEST METHOD:

6 % of 400 trees.
9 % of 200 acres.
4 % of 125 pounds.
8 % of 140 barrels.
16 % of 300 sheep.
8 % of 112$\frac{1}{2}$ bushels.
10 % of $500.
12$\frac{1}{2}$ % of $16.
12$\frac{1}{2}$ % of 16¢.
25 % £80.

16$\frac{2}{3}$ % of $60.
16$\frac{2}{3}$ % of 60¢.
33$\frac{1}{3}$ % $\begin{cases} \text{of } \$90. \\ \text{of } \$9. \\ \text{of } 90 \text{ cents.} \\ \text{of } 9 \text{ cents.} \end{cases}$
20 % of 60.
20 % of $\frac{1}{2}$.
75 % of 8.
10 % of $\frac{1}{3}$.

WRITE PROBLEMS SATISFYING THE FOLLOWING CONDITIONS:

1. Base, 96; rate, 25%; percentage to be found.
2. Base, $40; rate, 10%; percentage to be found.
3. Base, 160 men; rate, 5%; percentage to be found.

$$B \times R = P.$$

4. THE AMOUNT AND THE DIFFERENCE.

The Base plus the Percentage is the Amount.

$$B + P = A.$$

The Base less the Percentage is the Difference.

$$B - P = D.$$

1. I bought a cart for $30, sold it at a gain of 20%. How many dollars did I gain by the trade? What did I get for the cart? (In this example what is the Base? What the Percentage? What the Amount?)

2. A man had 8 A. of land and sold 10% of it; how many acres remained? (What is to be found?)

3. $75 + ⅕ of $75 = ?

4. $90 + 33⅓% of $90 = ?

4. Sixty cents less ⅔ of sixty cents is how much?

6. 90¢ less 66⅔% of 90¢ = ?

7. Ten per cent of my fifty pupils are absent; what per cent are present?

8. I planted 240 trees; 5% died; how many lived?

9. How must I sell a buggy that cost $60 so as to make 20%?

10. How must I sell a set of furniture that cost $80 so as to lose 12½%?

11. A merchant buys muslin at 18¢; how does he sell it so as to make 16⅔%?

12. The base is $5,000; the rate is 25%; find amount.

13. The base is $900; the rate 16⅔%; find difference.

14. The base is 720 bales of cotton; the rate 37½%; find amount.

15. A man bought 16 A. of land at $112½ an acre, and sold it at an advance of 20%; find selling price.

16. He bought a tract of 14 A. for $2800 and sold it at an advance of 25%: find selling price per acre.

17. A merchant having 520 bolts of cloth, sold 30% to one man, and 50% to another. How many bolts remained?

18. A mill is valued at $48000, of which A owns 10%, B 70%, and C the remainder. What is each man's share?

19. A lawyer charges me 8 % for collecting a debt of $840. What is his commission, and how much do I receive?

20. A cotton factor charges me 8 % for selling 90 bales of cotton at $38 a bale. What is his commission? What the net proceeds?

WRITE PROBLEMS SATISFYING THE FOLLOWING CONDITIONS:

1. Base, 72 boys ; rate, 25 per cent ; find difference.
2. Base, 500 A.; rate, 5 per cent ; find difference.
3. Base, 16¢ ; rate 12½ per cent ; find amount.
4. Base, 8200; rate, 8 per cent ; find amount.
5. Base, 65×80 ; rate, 9 per cent ; find difference.

5. TO FIND BASE, RATE AND PERCENTAGE BEING GIVEN.

MENTAL WORK.

If ½ my money is $40, what is all of it ?
If 50 % of a number is 60, what is the number ?
If ¼ of a man's age is 16 years, how old is he ?
If 25 % of a man's life is 13 years, what is his age ?
If ⅛ of a tract of land is 18 acres, what is all of it ?
Eighteen is ⅛ of what number ?
Twenty is 33⅓ % of what number ?
If ⅔ of a number is 40, what is ⅓ of it ? What is all of it ?
If 66⅔ % of a number is 60, what is all of it ?
If ¾ of my pupils are 18, what is ¼ ? How many in all ?
If 75 % of a number is 18, what is the number ?
28 is 50 % of what number ?
16 is 25 % of what number ?
12 is 33⅓ % of what number ?
14 is ⅛ of what ?
60 is 12½% of what ?
19 lbs. is 20 % of how many lbs.?
12 cents is 50 % of how many cents ?
If 6 % of a number is 18, what is 1 % ? What is 100 %, or the entire number ?
If 5 % of my property is $50, what is all of it ?
If 8 % of the trees in an orchard are 9, how many trees in the orchard ?

· If 6 %, or 18 men, are absent from a factory, how many are there when all are present ?

If the percentage is 15, the rate 3 %, what is the base ?

WRITTEN WORK.

1. If 9 % of a number is 72, what is the number ?

BY ANALYSIS:

$$9 \% = 72$$
$$1 \% = 8$$
$$100 \% = 800, \text{ Base.}$$

SECOND METHOD:

Base=Percentage÷Rate.

72÷9 =800

{ The percentage is the product of the base and the rate. P=B×R.
If one factor of a product is known, how may the other factor be found?
B=P÷R.

2. If 13 % of a man's stock is $390, what is all of it?

3. A man pays $240, or 16 % of his wages for rent; what is all of his salary ?

4. 450 acres are 15 % of a farm; how large is the farm?

5. A man spends $800 a year which is 80 % of his income; what is his income?

6. A man sold ½ of his cotton crop to one merchant, and ¾ to another, reserving 60 bales. What part of his crop was sold? What per cent was reserved ? How many bales did he make in all ?

7. A farmer sold 20 % of his corn crop to one merchant, 15 % to another, and 40 % to another; selling in all 1500 bushels. What was his entire crop? How many bushels were not sold ?

8. A teacher has spent 90 % of her month's salary, and has $6 left; how much is her salary ?

9. Sixteen girls, or 25 % of the class, failed of promotion; how large was the class ?

10. Two-thirds of my class are boys; there are 15 girls; how many pupils in the class ?

11. Thirty per cent of Miss Morton's class are boys; there are 28 girls; how many pupils in her class ?

Write two problems for finding the base, the rate and percentage being given.

6.   TO FIND BASE, RATE AND AMOUNT OR DIFFERENCE

BEING GIVEN.

1. Land is sold at $20 an acre, which is a gain of 25 % on the cost.   Find cost.

(The cost is the base; the selling price the amount. Let 100 % represent the base; then 100 % +25 % represents the amount.   But the amount, in dollars, is $20. So that)

$$\text{Amount, or } 125\% = \$20$$
$$1\% = \frac{\$20}{125}$$
$$\text{Base, or } 100\% = \frac{\$20 \times 100}{125} = \$16, \text{ cost.}$$

2. Land is sold at $72 an acre, which is a loss of 10 % on the cost.   Find cost.

$$\text{Difference, or } 90\%, = \$72$$
$$1\% = \frac{\$72}{90}$$
$$\text{Base, or } 100\% = \frac{\$72 \times 100}{90} = \$80, \text{ cost.}$$

3. The amount is $38.40, the rate 20 % ; find base.
4. The amount is $103.50; rate 15 % ; find base.
                                          ANS. $90.
5. The difference is $32; rate 20 % ; find base.
                                          ANS. 40.
6. A flock of sheep has increased 18 %, and now numbers 708; how large was it at first ?
7. There are 190 trees in an orchard, 5 % having died; how many were there at first ?
8. George sold his bicycle for $51 which was 40 % less than the cost; what did he give for it ?
9. My stock has increased in value 12 % in the last year, and is now worth $2240; what was it worth in January?

WRITE PROBLEMS FOR THESE :

Amount $72; rate 20 % ; find base.
Amount $86.10; rate 5 % ; find base.
Difference $56; rate 20 % ; find base.

7. TO FIND RATE, BASE AND PERCENTAGE BEING GIVEN.

MENTAL WORK.

What part of 8 is 4 ? What per cent of 8 is 4 ?
What part of $10 is $5. What per cent of $10 is $5 ?
What part of 12 acres is 3 acres ? What per cent ?
What per cent of 16 is 4 ?
What per cent of 15 is 5 ?
32 bushels is what per cent of 64 bushels ?
15 lbs. is what per cent of 45 lbs.?
14 is what part of 21 ? What per cent ?
I made $3 on an investment of $12; what per cent ?
Buy for $8, gain $2. Find rate per cent of gain.
Buy for $15, lose $5. Find rate per cent of loss.
Buy for $25, sell for $30. What is the whole gain ?
What is the rate per cent if $25 gain $5 ?
Buy for 16¢, sell for 20¢. Find rate of gain.
Buy for 50¢, sell for 40¢. Find rate of loss.
Buy for 40¢, sell for 50¢. Find rate of gain.
I invested $60, received $6 profits. Find rate.

WRITTEN WORK.

1. The base is 3,200, the percentage 256; find rate.

$R=P \div B.$
$256 \div 3200 = .08$ or 8 %.

{ The percentage is the product of base and rate.
  If one factor of a product is given, how is the other found ?

2. The base is 160 bu., the percentage 8 bu.; find rate.
3. The base is 75 men, the percentage 15 men; find rate.
4. I invest $250, gain $50. Find rate.
5. I invest $470, gain $28.20. Find rate.
6. At what rate will $300 gain $15.00?
7. When $144 gains $18 in a year, what is the rate per cent.?
8. I buy coal at $5 a ton, sell at $6. What per cent is gained?
9. Charles gave $75 for a bicycle, and sold it for $80. What per cent did he gain?
10. I sell shoes for $6, losing $2. Find cost, and rate per cent of loss.
11. I sell goods for $14, and lose $1. Find cost and rate per cent lost.

12. Buy for $72, sell for $80.   Find gain per cent.

8.   MISCELLANEOUS.

MENTAL WORK.

What is 16⅔ per cent of 66 bu.?
What is 66⅔ per cent of 24 bbls.
What is 100 per cent of any number?
If 50 per cent of a number is 75, what is the number?
If 66⅔ per cent. of a number is 12, what is the number?
Base is 180; rate, 2 per cent ; find percentage.
Base is $700; rate, 6 per cent ; find amount.
Sell for $72, and lose 10 per cent ; find cost.
Sell for $72, and gain 20 per cent ; find cost.
What is the product of the base and the rate?
What is the quotient of the percentage divided by the base?
If $16 gain $2, what is the rate per cent ?

WRITTEN WORK.

1. The par value of shares in a certain bank was $100 each, but the stock has advanced 20 per cent.   What will 9 shares cost?
2. When sold at an advance of 35 per cent how many shares can be bought for $1080?
3. When sold at 4 per cent discount, how many can be bought for $1152?
4. I send 48 bales of cotton to a commission merchant in Savannah.   They average 450 pounds each, and he sells for 9¢ charging me 1½ per cent for his services.   What is the amount of his commission?   He sends me a check for what amount?
5. Mr. Jones bought 18 shares of Georgia Railroad stock at a discount of 8 per cent and sold at an advance of 30 per cent.   What was his gain?
6. What must I pay annually for insuring my house to the amount of $6000, the rate being 3 per cent?
7. Property valued at $3600 is insured for ¾ of that amount at 2½ per cent.   What is the premium?
8. The Check Factory pays this year a dividend of 8 per cent.   Mr. Roberts receives as his share of the profits $160.   What amount of stock does he own?

9. What sum of money will yield an interest of $40 at 8 per cent?

10. I gained 5 per cent, or $250, on a certain invest-ment. What was the amount invested?

11. Bought a house for $2500 and sold at $3000. What per cent did I gain?

12. What per cent is gained by selling calico at 12¢ when it costs 10¢?

13. How must I sell calico that cost 9¢ so as to gain 33⅓ per cent?

14. How must I sell ribbon that cost 20¢ so as to lose 5 per cent?

15. In a certain school 60 per cent, or 120 pupils, are girls. How many boys?

16. In a certain school the boys number 80 pupils, the girls are 75 per cent. How many pupils in the school?

17. A's money is $150, B's ⅔ of that amount, C's as much as A's and B's, and D's 37½ per cent of A's, B's and C's. How much do they all have?

18. Mr. Owens has only 60 sheep left, after selling 15 per cent of his flock to one man, 33 per cent to another and 42 per cent to a third. Required the number which he had at first?

19. I sold a house for $1300. which was 30 per cent more than I gave for it. Find cost.

20. Sold a house for $1800 and lost 20 per cent. Find cost.

ANSWERS:

1. $1,800.
2. 8 shares.
3. 12 shares.
4. Commission, $29.16 Net
5. $1444. [pr'c'ds,$1914.84.
6. $180.
7. $67½.
8. $2000.
9. $500.
10. $5000.

11. 20%.
12. 20%.
13. 12¢.
14. 19¢.
15. 80 boys.
16. 320 pupils.
17. $187½.
18. 600 sheep.
19. $1000.
20. $2250.

CHAPTER X.

INTEREST.

I.

1. James Hardy borrows $40 from his father at 5 per cent to buy a bicycle. At the end of one year he pays his father $42.

This is a transaction in Interest. The $40 is the Principal; 5 per cent is the Rate; $2 is the Interest, and $42 the Amount.

       5% of $1 is how many cents?
       5% of $40 is how much?

Write definitions of the following terms:

       Interest.
       Principal.
       Rate.
       Amount.

(Any given rate is understood to be the rate per year, unless otherwise specified.)

In most States the rate is fixed by law. This is called the legal rate, but a higher rate is frequently charged. The legal rate varies in different States.

2.   MENTAL WORK.

What is the interest on $25 for 1 year at 6%?
What is the interest on $80 for 1 year at 7%?
What is the amount of $100 for 1 year at 7%?
What is the interest on $50 for 1 yr. at 10%? For 6 months at the same rate?
What is the interest on $40 for 6 mo. at 8%?
The amount of $50 for 6 mo. at 8%?
The interest on $60 for one-third of a year, or 4 mo., at 5%?
The interest on $30 for 4 mo. at 6%?
The interest on $80 for 3 mo. at 6%?
The interest on $100 for 2 mo. at 5%?
The interest on $60 for 1 year at 7%? For 2 yr. at the same rate?
The interest on $90 for 1 yr. at 10%? For 3 yr.? For 7 yr.?
The interest on $1000 for 1 yr. at 8%? On $6000? On 8000 for 2 yr.

The amount of $100 for 2 yr. at 7% ?
The amount of $500 for 3 yr. at 4% ?
The amount of $3000 for 2 yr. at 5% ?
The amount of $200 for 6 mo. at 7% ?
The amount of $400 for 1½ yr. at 6% ?
The amount of $600 for 1⅓ yr. at 8% ?

3.   WRITTEN WORK.

1. What is the interest on $204 for 2 yr. 6 mo. at 8% ?

PROCESS: $204
               .08
            _____
            $16.32 =int. for 1 yr.
                2½
            _____
            $ 8 16 =int. for 6 mo.
             32.64 =int. for 2 yr.
            _____
            $ 40.80 =int. for 2½ yr.

2. Find the interest on $800 for 2 yr. 6 mo. at 5 per cent.
3. On $600 for 2⅓ yr. at 7 per cent.
4. On $750 for 2 yr. 3 mo. at 6 per cent.
5. Find the amount of $630 for 4 yr. 8 mo. at 8 per cent.
6. The amount of $720 for 8 mo. at 5 per cent.
7. The interest of $480 for 2 yr. 5 mo. 9 da. at 8 per cent.

                    PROCESS:

(Int. for 1 yr. ⎧ $480
  =$38.40.   ⎪   .08
                 ⎪   _____
Int. for 1 mo.   ⎬ 12 | 38.40 × 2= $76.80, int. for 2 yr.
 = 1⁄12 of $38.40. ⎪ 30 | 3.20 × 5= 16.00, int. for 5 mo.
                 ⎪   _____
Int. for 1 da.   ⎪   .10⅔×9=   .96, int. for 9 da.
 = 1⁄30 of $3.20.) ⎩   _____
                        $ 93.76, int. 2 yr. 5 mo. 9 da.

8. What is the amount of $120 for 3 yr. 5 mo. 7 da. at
6 per cent. ?   ANS. $144.74.

9. Find the interest on $360 for 2 yr. 10 mo. 8 da. at 7 per cent.   ANs. $72.66.

10. Find the interest on $600 for 2 mo. 12 da. at 5 per cent.   ANS. $23.50.

4.   SIX PER CENT. METHOD.

1. Find the interest on $1 at 6 per cent for 2 yr. 9 mo. 12 da.

At 6 per cent the interest on $1

$$\text{For 1 yr.} = \$.06$$
$$\text{For 1 mo.} = .005$$
$$\text{For 1 da.} = \tfrac{1}{30} \text{ of 5 mills} = \tfrac{5}{30} = .000\tfrac{1}{6}$$

Hence: $\$.06 \times 2 = \$.12$, int. for 2 yr.
$.005 \times 9 = .045$, int. for 9 mo.
$.000\tfrac{1}{6} \times 12 = .002$, int. for 12 da.
_____
$\$.167$, int. for 2 yr. 9 mo. 12 da.

To find the interest on $1 for any number of years:
Multiply 6 cents by the number of years.

To find the interest on $1 for any number of months:
Multiply 5 mills by the number of months.

To find the interest on $1 for any number of days:
Multiply $\tfrac{1}{6}$ mill by the number of days.

2. Find the interest on $1 for 7 yr. 7 mo. at 6 %.
                                        ANS. $.455.

3. The interest on $1 for 3 yr. 7 mo. 18 da. at 6%.
                                        ANS. $.218.

4. The interest on $1 for 2 yr. 8 mo. 24 da. at 6%.
The interest on $500 for the same time and rate.
          ANS. Int. on $1 = $.164.
               Int. on $500 = 500 × $.164 = $82.

5. The interest of $25 for 3 yr. 6 mo. 20 da.
                                        ANS. 5.38\tfrac{1}{3}$.

6. The amount of $75 for 6 yr. 8 mo.   ANS. 103.12\tfrac{1}{2}$.

7. The amount of $750 for 4 yr. 3 mo. 6 da.
                                        ANS. $942.

8. The amount of $180 for 1 yr. 2 mo. 6 da.
                                        ANS. $192.78.

9. The interest of $360 for 4 yr. at 6%. The same at 7%.   Ans. Int. at 6 per cent.=$86.40.

    Int. at 7 per cent =$86.40+$\frac{1}{6}$ of $86.40=$100.80.

10. What is the interest of $300 for 3 yr. 6 mo. 24 da.

<div align="center">PROCESS.</div>

<div align="center">$300
.214</div>

($\frac{1}{3}$ of $64.20	3)$64.200=Int. at 6 per cent.
=Int. at 2 per cent.)	21.40 =Int. at 2 per cent.

<div align="center">$85.60 =Int. at 8 per cent.</div>

11. Find the interest of $256 for 3 yr. 4 mo. 12 da. at 8 per cent.

12. Find the amount of $384 for 8 mo. 18 da. at 9 per cent.

5.   PROMISSORY NOTES.

A Promissory Note is a written agreement to pay a sum of money at a specified time or on demand.

The *Face* of a note is the sum named in the note.

The *Maker* of the note is the person who signs it.

The *Payee* is the person to whom the money is payable.

An *Indorser* of a note is a person who writes his name on the back of the note, and thus makes himself responsible for its payment.

A note *matures* when it becomes legally due.

A *Demand* note is due on presentation; a *Time* note, in most States, matures three days after the time specified in the note. These three days are called *Days of Grace.*

1.

$235.00.   *Athens, Ga., June 1, 1890.*

For value received, I promise to pay, on demand, to Luther M. Spence, or order, Two hundred and thirty-five dollars, with interest at 8 per cent.   *George C. Wilson.*

The above note is paid in full Dec. 1, 1890. Find the amount paid.

2. Find amount of note for $137.50, from January 15, 1892, to June 15, 1893, at 6 per cent.

3. Find the amount of note for $620, from March 3, 1891 to July 18, 1892, at 7 per cent.

4. What will be due Dec. 20, 1893, upon a note given July 2, 1893, for $65, at 10 per cent?

5. George borrowed $200 from his father Jan. 8, 1892, at 6 per cent. On July 3d of that year, he paid him $60. What then remained due?   Ans. $146.

September 3d, he made a second payment of $47.46. What was due Jan. 3, 1893?   Ans. $102.

6. Jan. 2, 1893, I gave my note, bearing 8 per cent interest, for $400. Upon this note I made the following payments:

> Apr. 2, 1893, $80.
> Oct. 2, 1893, $140.
> Dec. 2, 1893, $75.

What is due July 8, 1894?   Ans $134.98.

6   BANK DISCOUNT.

Mr. Reaves gives his note to a certain bank for $800, due in 60 days at 8 per cent. What is the discount on the note, and what sum will Mr. Reaves be paid by the cashier ?

(Banks always add three Days of Grace to the time specified in the note, and count 360 days to the year.)

FIRST METHOD: $800
                      8
                   6|64.00 Int. for 1 yr.

                  20|10.66⅔ Int. for 2 mo. or ⅙ of a year.
                       53⅓ Int. for 3 da. or ₂₀ of 2 mo.
                   $11.20 Int. for 63 days, or bank dis'ct.

   $800—$11.20=$788.80 sum paid to Mr. Reaves.

SECOND METHOD: $800
                                    .08

                          $64.00 (Int. for 1 yr.=$64.00.
                                63   Int. for 63 da.=$\frac{63}{360}$ of $64.00.)
               360 | 4320.00
                          $11.20 Bank discount.

   $800—$11.29=$788.80, Proceeds.

Bank Discount is simply *interest paid in advance*, 3 days being added to the specified time.

2. Find the discount on a note for $380, for 60 days, at 6 per cent.   ANS. $3.99.

3. Find the proceeds of a note for $1000, for 90 days at 7 per cent.   ANS. $981.92⅔.

4. A note for $45, payable in 60 days, is discounted at the Savings' Bank at 6 per cent.   Find proceeds.
                                                    ANS. $44.52.

5. Find proceeds of a note for $250, payable in 90 days, discounted at 7½ per cent.   ANS. $245 15.

COMPOUND INTEREST.

When money is lent at *Compound Interest*, the interest at the end of each year, or other specified period, is added to the principal to form a new principal.

1. Find the compound interest on $80 for 3 years at 5%.

               $ 80
                 05

                 4.00   Int. for 1st yr.
                 80

               $ 84   New principal.
                 .05

               $ 4.20   Int. for 2d yr.
                 84

               $ 88.20   New principal.
                 .05

               $ 4.4100 Int. for 3d yr.
                 88.20

               $ 92.61   Amt. due at end of 3d yr
                 80

               $ 12.61 Comp. Int. for the 3 yrs. ($4+$4.20+$4.41=$12.61)

2. Find the compound interest on $520 for 4 years at 6%.

8. If $320 is loaned at compound interest for 2 years at 7%, what will the debt amount to at the end of the time? Is compound interest greater or less than simple interest? Why?

4. Mr. Morgan borrows $500 for 3 years at 6%, simple interest; how much less will his debt be than if he had borrowed the money at compound interest?

PRESENT WORTH AND COMMERCIAL DISCOUNT.

Is there any difference between paying $100 cash for an article, and paying $107 for it a year later, money being worth 7%? Why?

$208.   Birmingham, Ala., Jan. 1, 1895.
Six months after date, I promise to pay to the order of Cheever and Adams, Two hundred and eight dollars, value received.
*   (Signed)   Mark Howell.*

Who is the maker of this note? The payee? When is the note due? Is it an interest-bearing note? Is the *real* value of the note on the day it is given, $208, or less? Why?
If Mr. Howell should pay this note on the first of January, what deduction ought his creditors to make? Why?

What principal put at interest January 1, will amount to $52 by July 1, 8% being charged?

What principal at 8% will amount to $208 in six months?

What is the present worth of a note of $208, payable in six months without interest, when money is worth 8%? What discount should be allowed for the cash payment of such a note?

Write a definition of Present Worth. Of Commercial Discount.

PROBLEMS.

1. Find the present worth and true discount of a debt of
$456, due in 2 yrs., money being worth 7%.

　　100% = base, or principal.
　　14% = percentage, or int. for 2 yrs., at 7%.
　　114% = amt., or $456.
　　1% = $\frac{1}{1\frac{1}{4}}$ of $456.
　　100% = $\frac{456 \times 100}{114}$ = $400, or principal, which is
the present worth.
　　$456—$400 = $56, or discount.

(The RULE usually given is to divide the given debt by the
amount of $1 for the given rate and time; the quotient represents
the number of dollars in the present worth.)

Find the present worth and the discount of the follow-
ing debts, money being worth 7%.

2. $89.88 due in 1 yr.
3. $68.40 due in 2 yrs.
4. $97.20 due in 5 yrs.
5. $108.29 due in 1½ yrs.

CHAPTER XI.

AVERAGES, RATIO, PROPORTION, AND SQUARE ROOT.

AVERAGES.

1. During the past week, John's wages have been $1.67½,
$2.80, $3.25, $1.12½, $2.30, $1.20; what has he averaged
per day?

2. What is the average age of a class of 40 boys whose
combined ages amount to 670 years?

3. Thomas Calloway's report shows the following per
cents: Spelling, 90⅔; Geography, 88.3; History, 75.1;
Arithmetic, 96; Composition, 84. What is his scholar-
ship average?

4. May is 4 ft. 9 in. tall, Julia 5 ft. 2 in., Powell 4 ft. 3
in., Susan 5⅔ ft.; find their average height.

5. My account-book shows the following expenditures: January \$17½, February \$25, March \$16⅔, April \$17.625, May \$14.12½, June \$19.10. Find the average for the six months.

6. If equal proportions of coffee worth respectively 40¢, 35¢, and 27¢ a pound be mixed, what should the price of the mixture be by the pound?

7. A merchant mixes 10 ℔ coffee at 30¢, 5 ℔ at 40¢, and 20 ℔ at 35¢; how should he sell this mixed coffee by the pound?

8. A puts two thousand dollars into a business, B five thousand dollars, and C three thousand dollars. They make \$800 profits. That is how much for each thousand dollars invested? What is each man's share of the gain?

9. Three boys owe Mrs. Lane \$22.05 for board. Ralph has taken 18 meals, Edgar 19, and Walter 26; how shall they divide the debt?

10. On January 1, Mr. Vinson gives his note to E. S. Bell & Co. for the following sums: \$500 due in 2 months, \$100 in 5 months, and \$400 in 7 months. If he wishes to pay all the money at once, on what day would it fall due?

11. Find the equated time for paying \$50 due in 2 months, \$80 due in 6 months, and \$95 due in 8 months.

12. Find the equated time for the payment of \$300 due now, \$500 due in 60 days, and \$800 due in 90 days.

RATIO AND PROPORTION.

What is the relation, or ratio, of 4 to 8?

Of 3 to 6? Of 3 to 9? Of 5 to 20? Of 8 to 40?

Of 6 bu. to 12 bu? Of \$5 to \$45? Of 9 ℔ to 54 ℔?

Of 8 to 4? Of 12 to 3? Of \$50 to \$10? Of 16 yd. to 2 yd?

The ratio of 9 to 18 may be written 9 : 18.

Find the ratios of the following couplets:

5 : 15	84 : 21	12 hr : 60 hr.	1 da. : 1 wk.
9 : 81	66 : 11	3 da. : 30 da.	2 hr. : 1 day.

The *terms* of a ratio are called the *antecedent* and the *consequent*.

The direct ratio is the quotient of the antecedent divided by the consequent.

Complete the following:

4:8=?	9:?=3	$\frac{1}{4}:\frac{3}{4}=$
2:?=$\frac{1}{4}$	20:?=4	$\frac{1}{8}:\frac{5}{8}=$
4:?=$\frac{1}{4}$	?:10=2	$\frac{6}{7}:\frac{1}{7}=$
16:?=4	?:40=5	$\frac{9}{10}:\frac{3}{10}=$
?:8=2	?:5=8	$\frac{12}{11}:\frac{6}{11}=$

An equality of ratios is *a proportion*. Thus:

$3:6=4:8$ $\left\{\begin{array}{l}\textit{Read}\ 3\ \text{is to}\ 6\ \text{as}\ 4\ \text{is to}\ 8;\ \text{or, the ratio of}\ 3 \\ \text{to}\ 6\ \text{is equal to the ratio of}\ 4\ \text{to}\ 8;\ \text{or,}\ \frac{3}{6}=\frac{4}{8}\end{array}\right.$

Complete the following proportions:

4:12=5:?	3:?=2:10	?:5= 8:4
6:30=2:?	4:?=8:16	?:9= 5:2$\frac{1}{2}$
5:40=3:?	6:?=18:2	?:7=10:2$\frac{1}{2}$

7 bu.: 14 bu.=3 men: ? men.
$3: $18=? hats: 5 hats.
3 hr.: 15 hr.=? boys: 40 boys.
$5: $20=? rugs: 16 rugs.
2 yd.: 18 yd.=? bolts: 5 bolts.
40: 5=72: 9.

In the last proportion, what is the product of the *extremes*, 40 and 9? What is the product of the *means*, the other two terms? Test your other proportions in the same way.

1. If 8 bushels of clover seed sell for $16, then 10 bushels should sell for $20. Write these four terms in the form of a proportion. (Would there be the same relation between 8 bushels and 10 bushels, as there is between the *price* of 8 bushels and the *price* of 10 bushels?)

2. If 6 ℔ of corn sell for $18, what should 10 ℔ sell for? Express in the form of a proportion.

3. If $30 buy 10 sacks of flour, how many sacks ought $18 buy?

4. How many bushels of corn will $360 buy, when every 9 bushels costs $10?

5. If 144 ties bind 6 bales of cotton, how many will be needed for 90 bales?

6. If 30 bushels of wheat make 6 barrels of flour, how many barrels will 270 bushels make?

7. If 24 bundles of fodder weigh 42 pounds, what is the weight of 90 such bundles?

8. At 8 o'clock this morning the shadow of a post 5 ft. high measured 9 ft., and the shadow of a pine tree measured 72 ft. How high is the pine?

9. Arthur's and Walter's ages are as 9 to 4; Arthur is 18 How old is Walter?

10. George's and Henry's wages are as 7 to 3; George gets $108 a month. What does Henry get?

11. The profits of Moore & Lester's business this year were $3600. Moore had $18000 invested, and Lester $12000; how should the profits be shared? (What amount made $3600?)

12. Solve the proportion $6\frac{2}{3} : 8\frac{1}{2} :: 6\frac{1}{4} :$ ——.

$(8\frac{1}{2} \times 6\frac{1}{4}) \div 6\frac{2}{3} = \frac{17}{2} \times \frac{25}{4} \times \frac{3}{51} = \frac{50}{6} = 8\frac{1}{3}$.

Solve the following, cancelling wherever possible:

13. $9 : 720 :: 56 : ?$

14. $68 : 518 :: 126 : ?$

15. $35 : 48 :: 70 : ?$

16. $\frac{3}{4} : \frac{4}{5} :: \frac{27}{16} : ?$

17. $? : \frac{5}{16} :: \frac{28}{3} : \frac{10}{21}$

18. $\frac{2}{3} : ? :: \frac{4}{7} : \frac{14}{15}$

19. If 7 men working 8 hours a day earn $21, what should be the wages of 15 men working 6 hours a day?

20. If 8 tickets, each good for 200 miles, cost $48, what ought 11 tickets, each good for 320 miles, cost?

21. If 5 bales of cotton, averaging 420 pounds to the bale, pays the rent of a farm of 112 acres, how many bales averaging 400 pounds ought to pay the rent of 448 acres?

INVOLUTION.

What is the square, or the second power, of 4? What is the second power of 6? What is the second power of 8?

$3 \times 3 = ?$ $2 \times 2 \times 2 = ?$ $3^3 = ?$

$3^2 = ?$ $2^3 = ?$ $4 \times 4 \times 4 = ?$

$9^2 = ?$ $3 \times 3 \times 3 = ?$ $4^3 = ?$

What is the second power of 12? What is the third power, or the cube, of 5? What is the cube of 6?

What is the first power of any number?

Express in two ways the fourth power of 8.

What is the fourth power of 5? $6^4 = ?$

The process of raising a number to a required power is called *Involution*.

Find the values of the following expressions:

$$3^4 \quad (2\tfrac{1}{2})^2 \quad .9^2 \quad 13^2 \quad 18^2$$
$$5^3 \quad (3\tfrac{1}{8})^2 \quad .03^2 \quad 14^2 \quad 19^2$$
$$8^4 \quad (\tfrac{2}{3})^2 \quad .15^3 \quad 15^2 \quad 20^2$$
$$(\tfrac{1}{2})^2 \quad (\tfrac{5}{7})^3 \quad 2.1^2 \quad 16^2 \quad 25^2$$
$$(\tfrac{1}{8})^2 \quad (\tfrac{5}{7})^4 \quad 3.5^2 \quad 17^2 \quad 50^2$$

What is the difference between the second power of 1 and the second power of 10?

Between the second power of 10 and the second power of 100? Between 100^2 and $1,000^2$? Between $.1^2$ and $.01^2$?

EVOLUTION.

A *root* of a number is one of its equal factors.

What two equal factors in 25? What is the square root of 36? Of 49? Of 81?

What three equal factors in 8? What is the cube root of 8? What is the product of $3 \times 3 \times 3$? What is the cube root of 27?

Evolution is the process of finding the required *root* of a number.

SIGHT WORK.

Name the required roots of the following:

$$\sqrt{16} \quad \sqrt{225} \quad \sqrt{324} \quad \sqrt[3]{64} \quad \sqrt{\tfrac{81}{144}}$$
$$\sqrt{144} \quad \sqrt{196} \quad \sqrt{289} \quad \sqrt[3]{125} \quad \sqrt{.25}$$
$$\sqrt{169} \quad \sqrt{256} \quad \sqrt{625} \quad \sqrt[3]{8000} \quad \sqrt{.0225}$$

WRITTEN WORK.*

Find the square root of the following numbers.

176	1764	9216	10.24
676	2704	65536	.2025
784	3186	60225	$30\tfrac{1}{4}$

APPLICATION OF SQUARE ROOT.
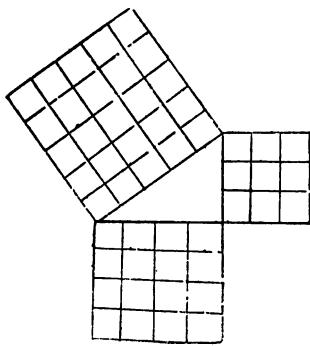
Let this right triangle represent one whose base is 4 inches, perpendicular 3 inches, and hypotenuse 5 inches.

How many square inches in the square erected on the base? On the perpendicular? On both? On the hypotenuse?

From the number of squares on the hypotenuse, subtract the number of squares on the base. How does the number compare with the number on the perpendicular.

Find the difference between the number of squares on the hypotenuse and the number on the perpendicular. Compare with the number on the base.

COMPLETE:

The square of the hypotenuse of a right triangle is equal to ——

---

*The METHOD is left to the teacher.

To find the hypotenuse of a right triangle: Add the square of the base and the square of the perpendicular; extract the square root of the sum.

The hypotenuse and one side being known, to find the other side: Subtract the square of the given side from the square of the hypotenuse; extract the square root of the remainder.

PROBLEMS IN RIGHT TRIANGLES.

1. Hypotenuse 35 ft.; base 21; find perpendicular.
2. Base 52; perpendicular 39; find hypotenuse.
3. Hypotenuse 115; base 92; find perpendicular.
4. Perpendicular 44; hypotenuse 55; find base.
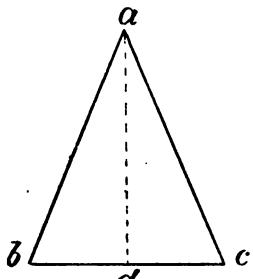
5. *ab* and *ac* are each 39 ft.; *bc* is 30 ft.; find *ad*.

6. *ab* is 55 ft.; *ad* is 44 ft.; find *bc*.

7. A rectangular field is 30 rds. by 40 rds. Find length of its diagonal.

8. The diagonal of a rectangular field is 25 rds.; the length of one side is 20 rds.; find area in acres.

9. If a room is 30 ft. square, what is the distance between its opposite corners?

10. Two rafters each 25 ft. long meet at the ridge of a roof 15 ft. above the garret floor. Draw the gable end of the house. How wide is it?

GENERAL REVIEW.

1. Find the boundary of a rectangle 42 ft. by 36 ft. Find its area. Divide it into two equal triangles. What is the area of each?

2. What is the area of a right triangle whose base is 18 ft. and perpendicular 13 ft. ?

3. How many cubic inches in a rectangular solid 5 ft. long, 4 ft. wide, 3 ft. thick? Draw it.

4. Of what number is 85 both divisor and quotient?

5. The divisor is 86, the dividend 42, the remainder 9; find quotient.

6. The subtrahend is 80⅓, the remainder 97⅝; find minuend.

7. The product is 865, one factor 39; find the other factor.

8. Add ⅚ of a dozen to ⅔ of a hundred and multiply by $\frac{7}{25}$ of a thousand.

9. If ¾ of a barrel of apples sell for $9, what will 2⅛ barrels sell for, at the same rate?

10. If ⅚ of my income is $210, what is ⅙ of it?

11. Find the cost of 4275 feet of lumber at $37 a thousand.

12. What number added to ¼ will make .75?

13. What number subtracted from ¼ will leave .05?

14. If a train moves 42 feet per second, how many miles is that per hour?

15. How many days from Jan. 1, 1896, to March 7, 1896?

16. A horse traveled 5½ miles in 34 minutes; what was his average speed per minute?

17. How many pieces of sod 10 inches by 12 inches will sod a terrace 90 ft. long and 5 ft. wide?

18. What will it cost to floor a hall 50 ft. long and 40 ft. wide at a cost of $13¾ per square of 100 feet?

19. What will it cost to paint a floor 18 ft. by 27 ft. at 25 cents per square yard?

20. A pint of water is put into a gallon of milk; what part of the mixture is water?

21. From a lot 90 rods square, I sold 90 square rods; how much remained?

22. A man gets $22 for splitting 3500 rails; what is the rate per hundred ?

23. When telegraph poles are 58 yards 2 ft. apart, how many are there to the mile?

24. When cross-ties are 2½ ft. apart, how many are there to the mile?

25. What part of a week is 28 hours?

26. What part of a leap year is 30½ days?

27. What part of an acre is 20 square rods?

28. What is the ratio of 1⅔ days to three weeks?

29. What is the ratio of .75 of an hour to 2 days?

30. A man pays $55.87 board for 37 days; what is the rate per week?

31. Flour that cost $4.25 is sold at a loss of 8%; find selling price.

32. A man bought two horses for $175 apiece; sold one at a gain of 18%, the other at a loss of 12½%. What was his entire gain?

33. I buy for $9, sell for $12; find gain per cent.

34. When $90 makes $7.20, what is the rate per cent?

35. I bought books to the value of $167.20; was allowed a discount of 15%; what should I have paid?

36. When $75 is paid for a year's policy covering $6000, what is the rate of insurance?

37. My house and furniture, worth $6000, are insured for ¾ of their value at ⅜%. What annual premium do I pay?

38. A man agrees to build a house in 80 days; and employs 18 men. If his time is extended 10 days, how many men can he discharge?

39. Bought 37 shares telephone stock at $107; sold at a discount of 2%; what did I lose?

40. When stock is at 7% discount, how many shares can be bought for $1116?

41. I borrowed $1600 for 2½ yrs. at 6%, compound interest. Find amount.

42. Find the present worth of a note for $940, due in 2½ yrs., at 7%.

43. A note of $500 payable in 60 days is discounted at the Merchants' Bank at 5%; find the proceeds.

44. A certain grocer gives only 15 ounces to the pound; how much does he cheat a man who pays him $6.72 for what he supposes is 96 pounds of sugar?

45. Divide $165 between two boys in the proportion of 2 to 3.

46. Divide $56 among three girls in proportion to their ages, 7, 9, and 12 years.

47. What sum bearing interest at $4\frac{1}{2}\%$, will yield an annual income of $90?

48. Find total wages for the week in the following Time-Sheet. Consider eight hours' labor a full day.

	Mon.	Tues.	Wed.	Thur.	Fri.	Sat.	Rate per day.
J. Miller	7	6	5	$3\frac{1}{2}$	10	4	$2.25
H. Morgan	9	7	8	8	8	4	$1.75
R. Bell	7	8	$8\frac{1}{2}$	6	10	6	$3.10
D. Seymour	8	6	7	$4\frac{1}{2}$	8	5	$ .87\frac{1}{2}
F. Allen	10	3	8	6	4	4	$1.12\frac{1}{2}
C. Davis	8	7	8	7	8	6	$2.15

49. What is an agent's rate of commission who charges $13.30 for collecting a debt of $380?

50. A, B and C are partners. A owns $\frac{1}{3}$ of the stock, B $\frac{2}{3}$, and C $5000. Their capital gains 12%. Find each man's profit.

51. What is $\frac{1}{8}$ of $(2\frac{1}{6}+6\frac{2}{3}+5\frac{1}{3})-(\frac{7}{8}\div\frac{1}{6}\frac{5}{8})\times\frac{2}{4}\frac{0}{1}$?

52. What is $\dfrac{.3+.18}{.006}-\dfrac{1.4\times.07}{5.6\div.8}+\dfrac{7}{500}$?
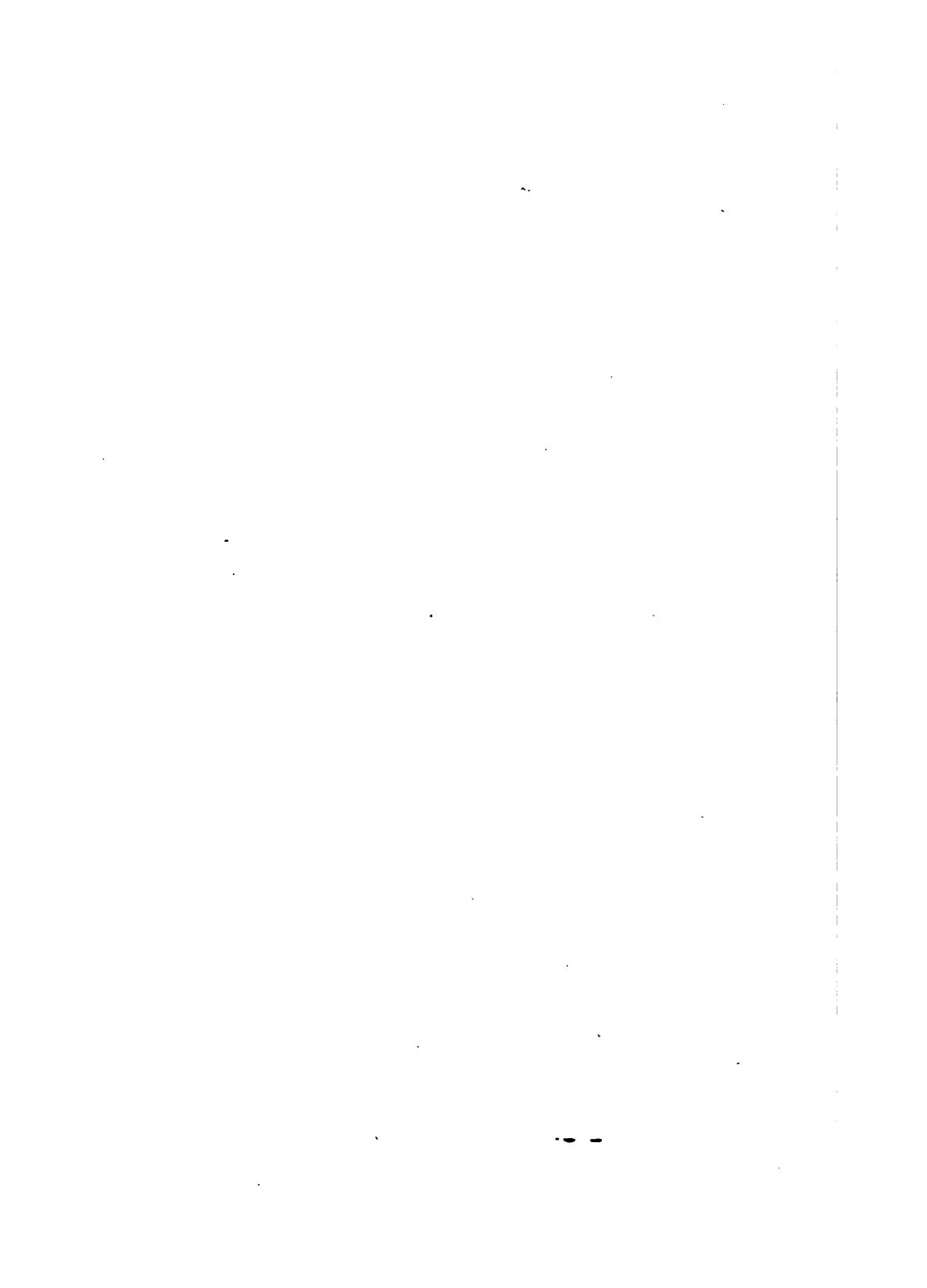
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